NEW ZEALAND
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The main hostel building and surroundings at Flock House Farm of Instruction, Bulls, which is conducted by the Department of Agriculture, is shown on our cover. The total intake of trainees, who must be at least 15 and under 18 years of age, is 50 a year. The course is for a year. Instruction is given in all aspects of sheep and cattle farming and dairying, with some training in carpentry, gardening, and poultry work. Trainees are expected to "learn by doing" and to get accustomed to completing a good day's work. An indication of the continued interest of young New Zealanders in farming as a career is the fact that applications have been received for courses up to 1964.

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NEW ZEALAND DEPARTMENT OF AGRICULTURE

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INVERMAY FARMERS' CONFERENCE

BROADENING of the scope of the programme for the second annual Invermay Farmers' Conference, held at Mosgiel and the Invermay Research Station, Taieri, Otago, early in March, by the inclusion of papers and discussion on animal husbandry topics did not bring the increased interest and attendance expected.

THE Invermay Station, in the 10 years since its establishment as a Department of Agriculture research station, has played a large part in pointing the way to the spectacular improvements in fertility and carrying capacity of much of Otago and Southland that have been attained in recent years.

THOUGH there seems little doubt that this is appreciated by the districts' farmers, there is not apparent yet the same enthusiasm shown further north for the type of open forum for research workers and producers that Invermay is attempting to provide by its annual conference. Southern farmers will need to show that they are more conference minded if the Invermay programme is to attain the importance in the farming year that has been won by similar farmers' conferences at Lincoln and Massey Agricultural Colleges and the Ruakura Animal Research Station.

Role of Invermay

The development of Invermay as a research station and its part in the solution of farming problems in Otago and Southland were referred to by Mr P. W. Smallfield, Director-General of Agriculture, in his opening address to the conference. Ten years ago the property was carrying about 500 ewes and the better land on the flat was being used for seasonal cattle fattening. By 1951 the stocking was reorganised and the Station carried about 900 ewes and supporting cattle and sheep, the equivalent over the whole 1,300 acres of 1.1 ewes per acre.

In bringing into production the scrub and gorse-infested land on the Station, data on land development and its associated problems were collected and last winter Invermay carried more than 2,600 breeding ewes and supporting cattle and sheep, equivalent to 3 ewes per acre.

"Invermay is now in a position to intensify its research work on soils, plants, and animals," said Mr Smallfield, "and its development has provided valuable information on methods of cultivation, seeds mixtures, fertilisers, lime, and minor elements, particularly molybdenum, that is important in marginal land development in Otago generally."

Vigorous Farming Economy

Farming in Otago, where nearly 80 per cent of the farming land was hilly and difficult to cultivate, remained practically static for 70 years until the advent of heavy crawler tractors and the use of aircraft.

"However, the picture has altered, and over the last six years the Otago farming economy has been one of the most vigorous in the Dominion," said Mr Smallfield. "During this period sheep numbers increased from 4,000,000 to 5,600,000 and over the two years ended 30 June 1958 the district's sheep increased by 800,000 or 17 per cent. Beef cattle numbers are also increasing. In 1950 there were about 21,000 beef breeding cows and heifers,

Part of Invermay Research Station photographed from the centre of the Hill Block in 1954. After 10 years' occupation by the Department of Agriculture Invermay's development stage is almost complete. The hilly part of the Station is an example of the hill country, estimated at about a million acres, which is one of the largest areas of undeveloped land in Otago and on which the district's agricultural future would depend, according to the Director-General of Agriculture, Mr P. W. Smallfield. He forecast extension of the Station's work on soil, plant, and animal relationships and the investigation of nutritional problems.

whereas today there are about 40,000. . . . Farmers are now topdressing nearly 500,000 acres per annum, double the area of eight years ago. Nearly 100,000 acres of new pasture are being sown each year, some 25,000 acres more than a decade ago."

One of the largest areas of undeveloped country and one on which the agricultural future of Otago would largely depend, said Mr Smallfield, was the hill country, estimated at about a million acres, extending from Palmerston to the back of Dunedin and across to the Clutha River. The hill portion of Invermay was an example of it and of what could be achieved on this class of country.

"Some of the land was cropped in the past, fertility is depleted, there is some reversion to scrub, and burning has been practised. Vegetation on areas that have never been ploughed is dominant snow fescue tussock. About 10 years ago work began in earnest to find how the productive capacity of the country could be increased, but not until five years ago was it found that on the tussock areas clover can be successfully established with about 3 cwt of reverted superphosphate per acre, molybdenum, and inoculation. With the roller drill 22 to 24 lb per acre of grass and clover seed is all that need be sown.

"We know now how to develop this country and over the past few years large areas have been improved. . . . There seems little doubt that if farmers are able to continue this work, this large area of tussock and reverted country should eventually carry another 2 or 3 million sheep and considerable numbers of cattle."

Mr P. W. Smallfield, Director-General of Agriculture, who in his opening address to the conference forecast that Invermay would play an increasingly important part in helping Otago farmers to expand the volume and efficiency of production and envisaged the Otago Land District in 30 years as among the foremost stock producing districts of the Dominion.

On the South Otago downlands, or "Browntop Belt", the hilly Catlins district in the extreme south-east, and in Central Otago there was a similar picture of transition and improvement since the Second World War. Much had been done and much awaited doing in the development of marginal land in Otago.

Role of Research

Essentially land improvement meant the establishment and maintenance of improved pastures and great advances had been made in recent years in elucidating soil fertility problems, particularly minor element deficiencies, continued Mr Smallfield.

"Molybdenum, for example, has given spectacular results in raising soil fertility; its use on many local soils has greatly reduced the amount of lime required to improve fertility and thus reduced costs of land improvement.

"We are today becoming much more minor element conscious; the use of cobalt, copper, and molybdenum is being extended and recent work with selenium for the control of white

[*"Otago Daily Times"*

F. A. Meeklah, of the Invermay Research Station staff, showing the results of an experiment in which good crops of swedes, turnips, and chou moellier were established by the "chemical ploughing" method of applying dalapon and amitrol to destroy the sward and drilling crop seeds into the dead turf. Interest in "chemical ploughing" in the South Island lies principally in its obvious potential for improvement of low-fertility browntop country, with which little success has yet been achieved in Invermay trials. Results with drilling of lucerne and cereals directly into the turf have also been poor. Lower rainfall and humidity in the South Island, leading to greater seedling mortality due to desiccation of improperly rooted seedlings, might account for less success at Invermay than in North Island trials.

muscle disease indicates that the investigation of minor element deficiencies must be extended."

Discovery of the major and minor element deficiencies of particular soils and the way to correct them was only the first stage in the investigation of land improvement problems, the next step being to discover how to secure a satisfactory seedbed. Land too difficult to cultivate had led to investigation of methods other than the traditional one of cultivation to bring the soil to a moist, fine, firm condition for sowing. A great deal of hill country had been improved by oversowing of clovers, which did not need a cultivated seedbed, but this method had not proved suitable for grasses. Recent work on the destruction of existing vegetation with weedicides and the oversowing of both grasses and clovers had given very promising results. It would enable many hundreds of acres, probably millions of acres, of hill country too steep to cultivate to be improved to the standard of a first-class pasture on ploughable land.

"Land improvement and increased stock carrying capacity often lead to the necessity to investigate livestock management and nutritional problems," said Mr Smallfield. "Important advances have recently been made in these fields. Invermay, now that its development stage is practically complete, will extend its present work on soil, plant, and animal relationships and the investigation of nutritional problems. The Department intends to strengthen animal research work as suitable staff can be secured and Invermay will play an increasingly important part in helping Otago farmers to expand the volume and efficiency of primary production. . . . I shall go so far as to say that in 30 years the Otago Land District will be among the foremost stock producing districts of the Dominion."

Mating of Hoggets

To obtain precise information on the economics of the mating of ewe lambs, their subsequent productive performance, and the breeding season of the Romney lamb, experiments with 300 ewe lambs have been conducted at the Invermay Station. Work so far, as reported in a paper by K. H. C. Lewis, research officer at the Station, to the conference, indicates that no major stresses are involved in pregnancy and lactation. However, though effects on growth and development might be expected to disappear before the 4-tooth mating, important effects on longevity, particularly in terms of soundness of teeth and udder, might arise.

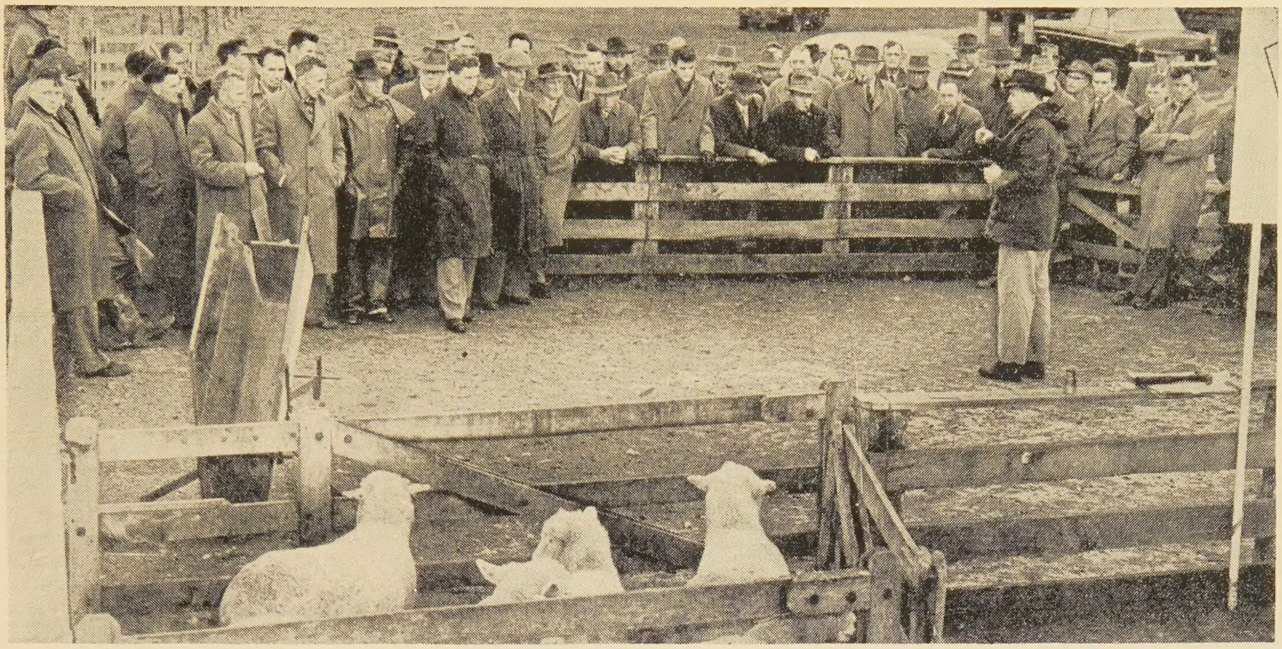
More than 100 lambs have been reared from ewe hoggets in the experiment and lifetime production records will be kept of the flock that has been established from ewes that have reared lambs as yearlings.

Broiler Chicken Competition with Lamb

"A NEW development in farming in the United Kingdom that will be of some consequence to us in New Zealand is the production of the broiler chicken," Mr J. S. Hunt, Wanaka, told the Invermay Farmers' Conference during a paper on his impressions of farming overseas.

"I had a good look at this industry, which was originally developed in the U.S.A. A broiler chicken is 9 to 10 weeks old and weighs between 2½ and 3 lb dead weight. They are reared in houses under artificial light on deep litter, one bird per square foot. Feed and water troughs are placed 12 ft apart so no bird has to walk more than 6 ft for a feed and a drink. Ventilation must be good and the air is changed 35 times each hour. Food is very concentrated and made palatable as well so that the birds eat because they like the food as well as because they are hungry. Antibiotics are added to control disease. Very powerful lights switched on for 20 seconds each hour during the night give the birds just time to wake up and feel hungry; then they must go to sleep again. When the lights do come on in the morning the birds are really hungry.

"Two years ago the consumption of broilers in the United Kingdom was one bird per person per annum. Last year it was up to two birds and the expected demand this year of three birds per person is going to put a severe strain on a young growing industry. This demand for chicken meat must affect the demand for our lamb."



["*Otago Daily Times*"]

Invermay, with a sheep flock of about 5,000, has been made the starting point of an intensive foot-rot eradication campaign in the South Island. Here I. M. Cairney, during the conference field trip, explains the eradication scheme at Invermay which is being used to train officers for extension of the work to farmer groups.

Farmers on the better class of land might choose to tap the productive potential of their hogget flocks, though a limited trial mating might be needed to convince them of the wisdom of the move.

Where lambs coming in season in May can have only one or perhaps two heat periods before rams are removed to avoid very late lambs, lambing percentages above 50 or 60 cannot be expected. "The day when the farmer cannot afford to reject any such limited source of productive increase may already be here," said Mr Lewis.

Selenium and White Muscle

Reference to the most promising results from experimental use of the mineral selenium in the prevention of white muscle disease in lambs in a paper by I. M. Cairney, Veterinarian, Department of Agriculture, Dunedin, caused keenest interest at the conference and provoked much discussion. The disease has shown up in several forms in a number of districts in the South Island.

In trials by the Department of Agriculture this season in Otago and Canterbury selenium used in the most minute amounts has given good protection. Many of the farms affected are on similar soil types and it is possible that the disease is due to a deficiency of selenium in them. A likely theory is that the absence of selenium interferes with the use of vitamin E by the animal.

Selenium is highly toxic and has caused serious stock losses abroad even in minute amounts. Pasture containing 5 parts per million has been proved dangerous.

Research is still in its early stages, and a great deal remains to be done; for instance, to find whether it can safely be used as a pasture topdressing and at what rate, and the uptake by animal tissue.

There is evidence that selenium has in some cases of unthrifty lambs caused a substantial improvement in growth rate and hence it may play an important part in the prevention of some types of ill-thrift.

Flock histories of properties where white muscle has occurred show abnormally high percentages of barren ewes which may also be due to a soil deficiency of selenium. Extensive trials are planned to begin immediately to investigate the problem further.

"It is of the greatest importance," said Mr Cairney, "that farmers realise the dangers associated with the misuse of selenium. It should be used only on the advice of an officer of the Department of Agriculture or a veterinarian."

Wool Improvement

Because New Zealand is the only country with an advanced agriculture producing large quantities of wool stronger than 52s count, problems in the production and use of this type of wool would not be solved by overseas research but only by our own efforts, said D. A. Ross, New Zealand Wool Industries Research Institute, in his paper to the conference.

Research must be put on a firm footing by first obtaining a clear picture of the types and uses of the wool we produce. Serious attention must then be given to the characteristics of the types of wool we wish to produce by finding out the importance of these characteristics during manufacture and in the final cloth. More use must also be made of the data available on the economics of wool production and marketing.

"Yet probably the most important and pressing of all our problems," said Dr Ross, "is a realisation of the important part wool plays in our economy and a change from the attitude that wool is a by-product of sheep farming and the fatalistic outlook on wool improvement engendered by this attitude.

"The fact that only 10 per cent of our wool is free from serious faults and that 30 per cent of our clip is very faulty, inferior wool shows the necessity for an immediate and vigorous wool improvement programme."

Practical farm management papers by Mr C. W. H. Tripp, Gore, and Mr S. E. Davis, Crookston; a paper on hydatids by Mr M. A. Gemmell; and inspection of projects at Invermay and the Hydatid Research Unit completed a programme that could have been expected to attract wider interest.

Recent Research Work

Impurities in Cocksfoot Seed;

Rates of Sulphur and Phosphorus

THE most common impurity in New Zealand cocksfoot seed is empty glumes or seeds in which there is no kernel development, incidence of upward of 30 per cent being common. Imported lines of seed, on the other hand, usually contain less than 10 per cent of empty glumes. These empty glumes are lighter than normal mature cocksfoot seeds and might well be separated by air blast, though perhaps with some loss of normal seeds in the process. An experiment has been conducted at the Department of Agriculture's Seed Testing Station, Palmerston North, with an air blast capable of accurate adjustment to determine whether the removal of an appreciable proportion of empty glumes could be carried out without loss of viable seed.

FOUR lines of machine-dressed cocksfoot seed, with purities ranging from 56 to 67 per cent, were used in the experiment, with duplicate samples subjected to each treatment. Different samples from each line were submitted to progressively stronger air blasts.

RESULTS FROM TREATMENT

THE average purity of the lines before treatment was 62.9 per cent, with 34.6 per cent of inert matter, predominantly empty glumes. The weakest blast used raised the average purity to 70.5 per cent, the next to 79.1 per cent, and the strongest used on all lines to 85.5 per cent. These last samples contained an average of only 12.1 per cent of inert matter.

Samples from two of the lines were subjected to an even stronger blast, which lifted the average purity of these to 90 per cent, with 7.2 per cent of inert matter.

All seeds in the blowings were tested for germination; with the stronger blasts the average content of germinating seeds removed was 1.5 per cent, representing a loss based on the original condition of the lines of about 0.3 per cent. Fewer viable seeds were removed by the weaker blasts.

In two lines the percentage of pure seed which was capable of germinating was not affected by blowing, but in the other two lines having lower initial germinations this percentage in the heavily blown samples was improved by over 10 per cent.

It may be concluded that under fully controlled conditions of blast a considerable proportion of the empty glumes present in cocksfoot seed may be removed without any significant loss of viable seeds. The pure germinating capacity of the lines is thereby considerably raised. Improvement in the germinating capacity of the pure seed may also sometimes result, thereby further improving the pure germinating seed content.

Though similar results may not be practicable or economic for all lines of seed under the less adequately controlled conditions in commercial seed-dressing plants, it is suggested that a considerable reduction in inert matter could be made in many of the lines of seed on the local market.

☆ ☆ ☆ ☆

Sulphur and Phosphorus Deficiencies

Sulphur deficiency has been found to be widespread in various parts of Otago, Canterbury, and Marlborough. Some soils in these areas do not require phosphorus; on other soils phosphorus responses are obtained, though a very much better response often follows the addition of both phosphorus and sulphur; and on some soils quite good responses are obtained from sulphur alone. On all of these areas the relative importance of the two deficiencies must be investigated to determine what combination of phosphorus and sulphur fertilisers is most payable. A large number of trials is being conducted to obtain this information.

Previous work has shown that increasing the rate of sulphur in relation to the rate of phosphorus may be beneficial on the more responsive sulphur-deficient areas. The mixture to be used cannot be standardised, but the most satisfactory combination appears to be a mixture of superphosphate and sulphur containing 400 lb of sulphur per ton.

RESPONSES FROM HIGHER RATES OF SULPHUR

EXPERIMENTS now in progress indicate that increasing amounts of sulphur applied in addition to a standard rate of phosphorus may in some instances give increasing responses. Thus in one trial on the northern side of the Rakaia Gorge, where both phosphorus and sulphur would be considered to be deficient, it was found that with a rate of 22 lb per acre of phosphorus an increase in the rate of sulphur from 10 to 20 lb per acre gave a very big increase in the response. An even heavier rate of sulphur (40 lb per acre) further increased the response. On the same area increasing the rates of phosphorus with a standard rate of sulphur gave no increased responses for the additional rates of phosphorus.

As a number of factors influence the relative importance of these two deficiencies, recommendations must be based on results of trials such as the one quoted. For this reason farmers should consult officers of the Department of Agriculture about the mixture which could be recommended for any given district. Such factors as the type of parent material from which soils have been derived, the degree of leaching as influenced by slope and rainfall, the type of season, and forms of sulphur used may all influence the results.

Evidence does suggest, however, that there are a number of areas in the South Island where it would pay when topdressing a considerable acreage of country deficient in both phosphorus and sulphur to increase rates of sulphur in relation to the amount of phosphorus.

—*W. R. LOBB, Christchurch*

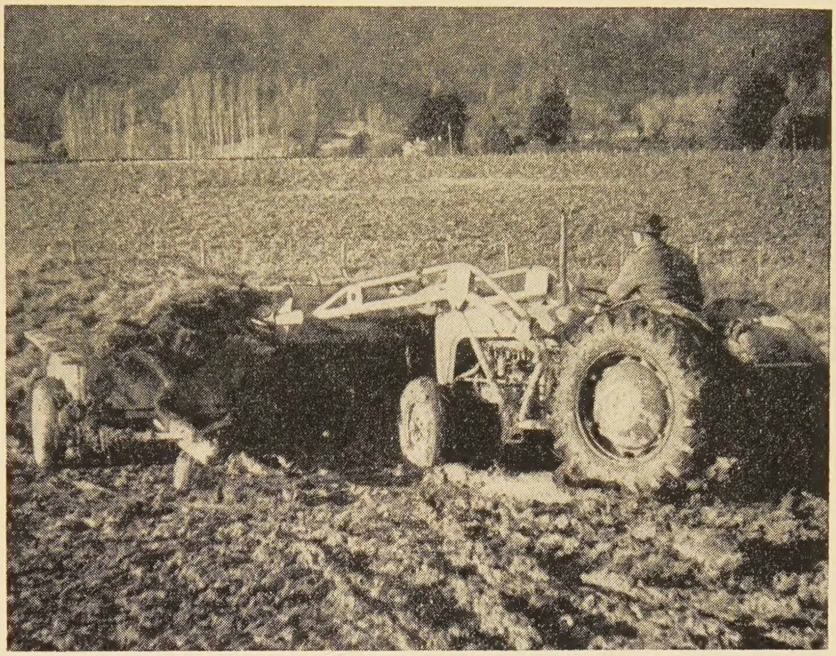
Making and Feeding Silage on a West Otago Farm

By M. L. SMETHAM,
Assistant Instructor in Agriculture,
Department of Agriculture,
Gore

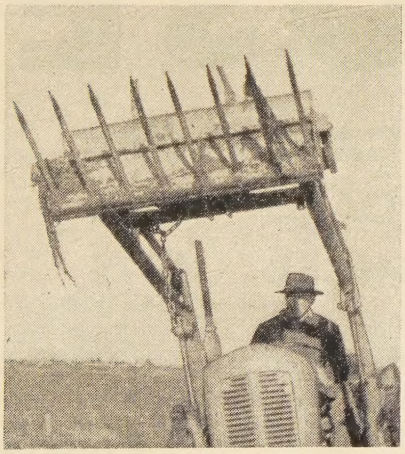
CONSIDERABLE interest is being shown in silage in the Otago-Southland area. Sheep farmers are, however, not inclined to make silage because of the labour involved, particularly at feeding out. The system used by a farmer who found no difficulty in making silage, or in getting sheep to eat it, is described in this article and emphasis is laid on his novel way of feeding out, which greatly reduced the man power and hard work which would otherwise have been required.

THE farm referred to is fairly typical of West Otago farms, being of some 370 acres with a heavy stocking of ewes, hoggets, and some beef cattle. About 30 acres of wheat are grown, with 30 acres of turnips and swedes for winter feed and 6 acres of lucerne cut for hay.

In January and February 1958 the district experienced a flush of growth which the stock could not control. At least one paddock on the farm had to be closed from grazing and the problem was how to utilise the feed. The farmer decided to make silage. The 13-acre paddock chosen was one with a good balance of grass and white clover about 12 in. high but with the grass not quite in full flower.

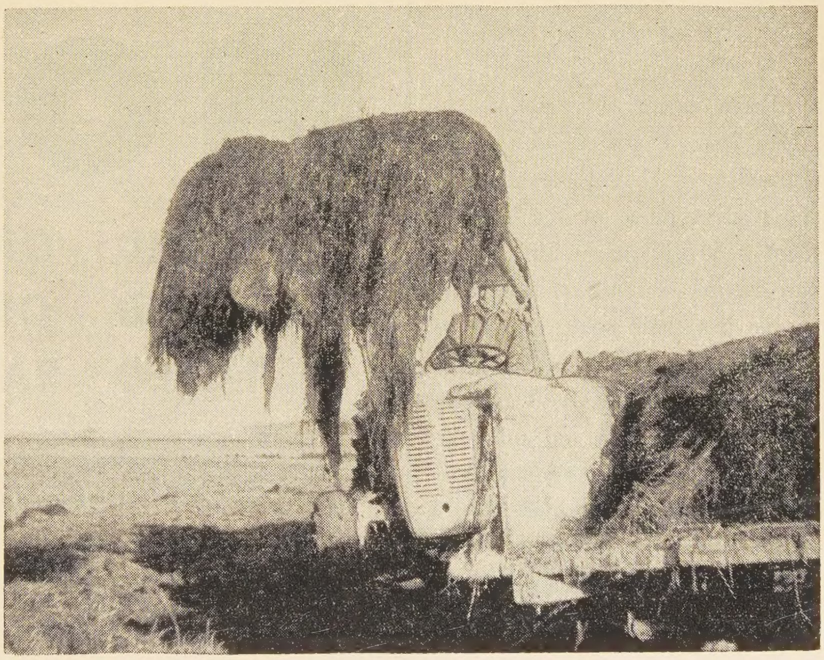


The muck tines on the loader peel the silage off the wedge in layers. With this method 1 ton of silage can be loaded in 10 to 15 minutes.

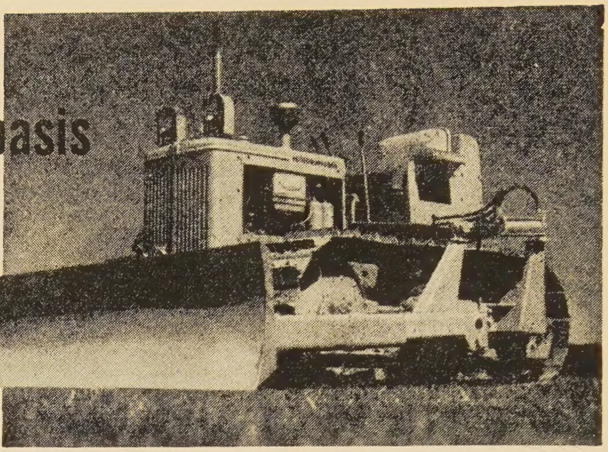


The muck tines mounted on the front-end loader. The unit is 3 ft 6 in. wide and the tines are 22 in. long.

▼ With the front-end loader 2 to 2½ cwt of silage can be dug out without preparatory cutting.



shifts levelling to a profitable basis



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When silage was fed out to ewes the majority of them quickly acquired a taste for it. After a month of feeding on silage 800 ewes were eating 15 cwt of it daily.

Siting of Wedges

To cut down cartage time with the buckrake two wedges were built, one on each side of the paddock. Each wedge was sited on a short, steep slope so that when consolidated the top of the wedge was nearly level. Care was taken to place them so that surface drainage water from the paddock did not run into them, and good drainage was obtained from the bottoms of the wedges.

Cutting and Building

Because of the weather at the time the material to be ensiled was lush and was subject to heavy dews and some rain both before and after cutting.

When ensiled, lush material and material wet with dew are slow to heat up. Wilting after mowing speeds up heating in the clamp and so a method was used by the farmer to allow cut material time to wilt. This was done by cutting 1 acre in the late afternoon and 1 acre next morning, and delaying the starting of filling operations each day until 1 p.m. Thus, the evening cut material was allowed 20 hours and the morning cut material 6 hours to wilt.

Initially, 2 acres were cut and the material was put in the wedge and left for 2 days to heat up to 104 to 120 degrees F. Cutting and building then proceeded with the system described above.

For transport the buckrake mounted on the front-end loader arms was used. Buckraking of the 2 acres of cut and wilted material took about 2 hours, and 1 hour each day was spent on teasing out and consolidating green material loaded into the clamp. The total time taken each day to handle 2 acres of cut material was about 3 hours.

Control of Temperature

The temperature in the wedge must be rapidly raised to between 104 and 120 degrees F and then held at this level. Checks of the temperature were taken daily in all parts of the wedges. The temperature of unconsolidated material tends to rise and that of material consolidated by rolling to fall, and it was found that to stop the temperature of the final layer of each day's filling from going too high it was necessary to roll the wedges with a heavy tricycle tractor for 15 minutes at the conclusion of filling. Measurement of the temperature next day showed that this had prevented too high a rise.

The rolling of wedges, clamps, and buns with tractors can be extremely dangerous. However, with the tricycle tractor used consolidation right to the edge of the wedge was possible with perfect safety, as the fore-carriage had sufficient weight per tyre area for the purpose. This obviated having to travel near the edges with the rear wheels.

Technique with the buckrake was important. The farmer found it best to sweep in the direction of the swath at 3 m.p.h. until the buckrake would pick up no more grass, then back out and attack the heap from the other side at 6 to 7 m.p.h. The buckrake thus picked up a full, 12 cwt load.

The front-mounted buckrake has two big advantages for silage making over the more conventional, rear-mounted machine. Firstly, loads can be placed higher and more accurately on the wedge. This facilitates the construction of a good-shaped wedge. Secondly, it is possible to tease out dumped loads by using the buckrake like a bulldozer to spread the green material, thus eliminating one of the most backbreaking jobs in silage making—the all-important one of even spreading over the stack.

Finishing the Wedges

Care was taken to see that the wedges were finished to a dome shape, and after all green material had been gathered a close check was kept on the temperature in the top half of the wedge, which reached a maximum height of 12 to 14 ft. It was found that each wedge had to be rolled for a total of 40 minutes to keep the temperature down below 120 degrees F after the last filling. Thereafter the temperature slowly dropped. Finally the wedges were covered with heavy building paper, with a layer of old hay on top of this.

Feeding out

The wedges were opened on 15 May, the silage being a khaki-green colour with a not unpleasant, sharp, acid taste and smell. The ewes were confined in a fairly bare paddock and the silage was fed out to them on the ground. Though for 2 days they were not too interested in the silage, they soon acquired a taste for it and by the beginning of June all but a very few were eating it as eagerly as hay. On one occasion the ewes had cleaned up their day's ration of silage and had started on the hay. For the writer's benefit more silage was scattered about in the paddock and nearly all the ewes left the hay, which included some lucerne hay, and started to eat more silage.

Quantities Fed

Ewes were started on 15 May with 6 cwt of silage per 800 ewes, plus 14 to 16 bales of hay every second day. At the end of June they were eating 15 cwt of silage plus hay every alternate day. Toward the end of July it was planned to give the ewes ad lib silage supplementary to hay and turnips. The 32 cattle received ad lib hay, plus 22 cwt of silage every second day. The silage was soon cleaned up, the cattle, too, liking it very much.

Method of Feeding out

With the system used on this farm two men, or one man if necessary, can feed out 15 cwt of silage to the ewes and 1 ton of silage to the cattle in just over one hour. The equipment used was the same front-end loader fitted with muck tines and a small two-wheeled trailer which when fully loaded carried about 22 cwt of silage. The muck tines are like a miniature buckrake with tines 22 in. long and an overall width of 3 ft 6 in.

The trailer was unhitched alongside the wedge and the loader was used to peel off layers of silage, taking about 2 to 2½ cwt out at a time. No preparatory cutting of the silage is necessary with this method of removal. To avoid drying out of the clamp the silage was taken from the side, the loader working from top to bottom on a width of 3 to 4 ft. The trailer was then hitched up and one man forked the silage off as the outfit travelled across the feeding paddock.

Equipment

The only extra equipment needed for the above method of silage making and removal is that described, the front-end loader with buckrake and muck tines. The capital cost of these is about £240 (over and above the cost of the tractor). However, it must be remembered that the usefulness of the front-end loader does not stop at silage making. The buckrake can be used for loading hay bales, and the front loader with a bucket attachment can be used for a large variety of jobs.

Costs of Making Silage

Costs below are based on a contractor's charge of 32s. 6d. per hour for this type of equipment and the labour required. Times quoted are per acre with a total for the 13 acres made into silage.

	£	s.	d.
Mowing at 1 acre per hour	1	12	6
Buckraking and clamping at 1½ hours per acre	2	8	9
3 hours' rolling with tricycle tractor for the produce of 13 acres, that is, 14 minutes per acre		8	1½
Total cost per acre ..	4	9	4½

One of the two wedges was rectangular, 18 ft x 33 ft x 4¼ ft deep, and the other circular with a depth of 4 ft and a diameter of 20 ft. It was calculated that 78 tons of silage were made and that the wastage was about 3 tons. On this estimate the yield per acre was 6 tons of silage, and the cost per ton of silage was about 14s. 11d.

Successful Results

The farmer is satisfied that good silage can be easily made and that both sheep and cattle thrive on a mixed diet containing a fair proportion of silage. He maintains that it is cheaper than hay and as convenient to make. It can be made under unsettled weather which would cause hay to be of very low feeding value. There is a place for silage on many farms in Otago and Southland, particularly under the conditions obtaining last year which resulted in abnormal pasture growth that could not be effectively grazed or conserved as hay.

Programme for 1959 Ruakura Farmers' Conference Week

THE 1959 Ruakura Farmers' Conference Week, the eleventh since the Week was established in 1949, will be held at the Department of Agriculture's Ruakura Animal Research Station, Hamilton, from 16 June to 19 June.

As in previous years the Conference will be divided into sheep farming and dairy farming sections, papers for sheep farmers being given on the first day, those for dairy farmers on the last day, and papers on subjects of interest to all farmers on the third day. All these sessions will be held in the new Ruakura Farmers' Hall, which was officially opened on the Station at last year's Conference.

The high light of the Week, the field day, when the Station will be thrown open to public inspection, will be on the second day. Though these field days have not always been favoured with kind weather, they have drawn crowds of several thousand. They give farmers the valuable opportunity of seeing the research projects being carried out on the Station and of discussing them with the Station staff.

Two of the evening sessions this year will be devoted to talks on agriculture in other countries; one will be about Japanese farming and the other about farming in the U.S.S.R.

Copies of the "Proceedings", containing all papers and discussion, will be printed and will be sent to those who pay the enrolment fee of 10s.

The tentative programme for the Conference Week is:

Section for Sheep Farmers
(Tuesday 16 June)

"Cost and Profits in Beef Cattle Production" (N. A. Clarke); "Achieving Health and High Calving Percentages in Hill Country Cattle" (E. D. Fielden); "Further Studies with Hexoestrol for Beef Production" (G. Everitt); "Lamb and Beef Production under Different Systems of Stocking" (D. E. Walker); "Mixed Age versus Cast-for-age Ewes in Fat Lamb Production" (C. P. Tebb); "Selenium and Animal Health, its Relation to White Muscle Disease and Ill-thrift in Sheep" (W. J. Hartley).

Evening: "Farming in Japan" (P. D. Sears).

Section for All Farmers
(Wednesday 17 June)

Field day.

Evening: "Farming in the U.S.S.R." (P. G. Stevens).

Section for All Farmers
(Thursday 18 June)

"Electric Fencing on Hill Country" (G. Umbers); "Farm Budgeting to Increase Profits" (W. O. McCarthy); "Further Studies on Topdressing" (L. Karlovsky); "Cereal Growing in the Waikato" (I. L. Elliott); "Fungi Affecting Pastures, Crops, and Animals" (I. D. Blair); "Silage in Animal Nutrition" (L. R. Wallace).

Section for Dairy Farmers
(Friday 19 June)

"Developments in Herd Improvement Methods Overseas" (A. Stewart); "The Relationship of Inheritance and Environment to Herd Production" (P. J. Brumby); "Management Factors Associated with High and Low Producing Herds" (J. D. J. Scott and D. S. M. Phillips); "Factors Affecting the Efficiency of Conversion of Pasture to Butterfat" (C. P. McMeekan); "The Rearing of Calves on Milk Substitutes" (I. Campbell); "How I Would Keep My Herd Healthy" (T. C. Wallace).

63 Years of Fruit Tree Spraying in Canterbury

PIP and stone fruits have been produced commercially in Canterbury for about a century, but for the first 40 years no spraying was done to prevent the ravages of insect pests and diseases. In this article J. Coombe, Senior Horticultural Instructor, Department of Agriculture, Christchurch, traces the changes in equipment that have occurred since spraying was first carried out in 1895 with a small hand-operated sprayer.

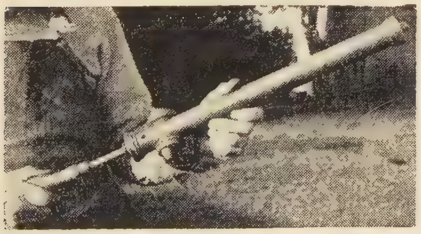
WHEN spraying was first begun, the fruit industry was in a chaotic state. No recognised cultural methods were practised, pruning was done spasmodically in some orchards and not at all in others, disease was rife in every orchard, and fruit was poor in appearance and quality, much of it going to cider factories. Many of the insect pests and diseases which can be troublesome today were widespread 60 years ago.

At that time codling moth was just making its appearance, but leaf-roller caterpillar, pear or cherry slug, leaf hopper, woolly aphis, pear leaf blister mite, and mussel and oyster shell scales were prevalent. Though brown rot of stone fruit was not recorded until 1915, other diseases such as shot-hole fungus, silver leaf, rust, leaf curl, and black spot were causing serious losses.

In 1894 fruitgrowing in Canterbury was more extensive than it is today. Orchards appear to have been established in Akaroa, Ashburton, Cheviot, and in the Christchurch suburban areas of Papanui, Riccarton, St. Martins, Dallington, and Woolston. In all there were probably about 1,700 orchards, about half of which were of more than 1 acre; some were quite large.

Earliest Equipment

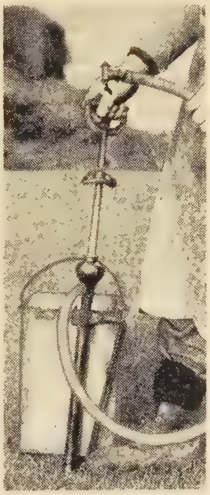
When spraying was begun it was carried out by only a few growers and only one or two sprays were applied each year, as it was not possible to apply more with the equipment then available. The first spray pump used was one of "Stones" adjustable plunger syringes.



1895: "Stones" adjustable plunger syringe.

This pump was fitted with three different types of jets. Two of these enabled the operator to produce a fine or coarse spray according to the tree size and height; the third was not suitable for spraying fruit trees. The coarse nozzle delivered a heavy, narrow stream of spray which could be directed upward for 18 to 20 ft, but it was very wasteful. The fine nozzle produced a wide stream of finer spray, giving much greater coverage than the coarse nozzle, but was much slower to work.

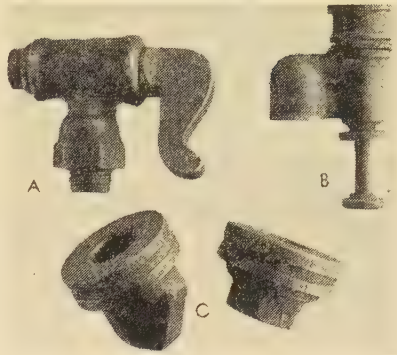
These pumps were simple to operate, but were very tiring to the operator and only a small number of trees could be covered in a day. The nozzle end of the pump was placed in a bucket of spray and the handle drawn back to its fullest extent. The nozzle was then directed at the tree and the handle pushed in to force out a stream of spray. Under average conditions one man could apply about 80 gallons of spray per day, though the amount varied according to the size of nozzle used. As about 2½ gallons of spray is needed for good coverage on the average fruit tree in full leaf, an acre of trees took about five days to spray.



1896: "Deeming" bucket pump with bordeaux nozzle.

In 1896 two new types of spray pumps were imported. These were the "Deeming" bucket pump and a sprayer manufactured in Dunedin which was operated by a compressed-air chamber.

The bucket pumps were operated by placing the pump in a bucket of spray and working the plunger up and down while directing the spray with the other hand. The operator could not move about with the delivery end as he had to have one foot on the foot-plate of the pump to hold it firm.



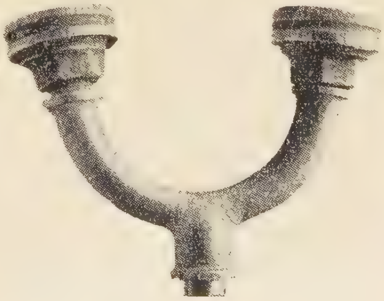
A—Bordeaux nozzle. B—"Vermoral" nozzle. C—Cyclone nozzles.

Spray did not travel as far or as high with these pumps as it did with the syringe mentioned earlier, but they produced a continuous stream as long as pumping was maintained. One man could apply 80 gallons of spray per day under average conditions with the bucket pump, which is still the most popular type with home gardeners, though models now used have a cyclone nozzle instead of a bordeaux or "Vermoral" nozzle. The cyclone nozzle was first used about 1906.

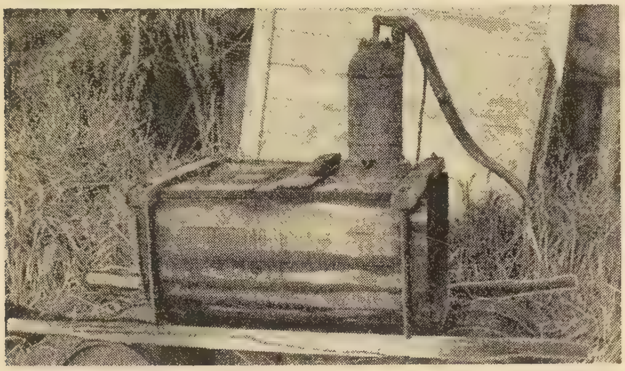
A compressed-air chamber sprayer operated by partially filling the container with spray, screwing the cap on, and then pumping it up with air until there was sufficient pressure to force the spray out never became popular.

Larger Outfits

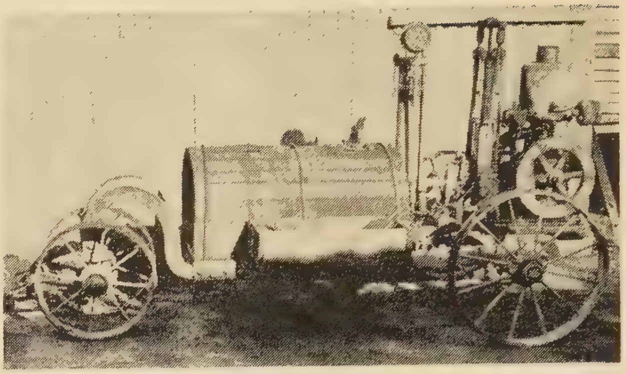
A relatively large spray outfit was first used in 1909. This consisted of a 25-gallon wooden vat with a much larger pump than had been used previously. The pump, a "Myers Perfect" barrel hand pump, was similar in appearance to many used on wells. It was claimed that pressures up to 150 lb per square inch could be developed and that one strong, energetic man on the pump could keep two men spraying for a short period.



Y cyclone nozzles.



1909: "Myers Perfect" barrel pump.



1910: "Bean" spray outfit to which was fitted the first power-driven pump.

These outfits were generally mounted on horse-drawn sledges, and with two men an output of 100 gallons per day was possible.

About this period Y cyclone nozzles became popular, as they enabled operators to cover the trees much faster. These were generally used on a long rod, sometimes up to 10 ft long for large trees.

Larger pumps similar to that just described but fitted with handles that allowed two men to do the pumping were imported a year or two later. The outfits could cover a greater area in a day, but four men (two pumping and two spraying) were needed.

The first complete spray outfit constructed on wheels and chassis with a 36-gallon spray vat and hand pump appeared in 1910. The pump was operated by two men from a stand on the back.

The pump on this outfit, a single-action "Bean Magic No. 10", was later coupled to a 1 h.p. "Novo" water-cooled engine by direct drive, which enabled a spray pressure of 225 lb per square inch to be developed. Fitting a petrol engine to this pump saved the work of two men and improved the spray pressure. This outfit was first used by a nurseryman at Rangiora and then by a fruitgrower at Horotane up to 1956.

The first power-driven spray outfit was imported into Canterbury in 1911. An "IHC" sprayer fitted with a 35-gallon spray vat, a "Myers" 5-gallon-per-minute pump, and a "Mogul" $1\frac{1}{2}$ h.p. petrol engine coupled direct to the pump, it was considered a wonderful advance in spraying equipment.

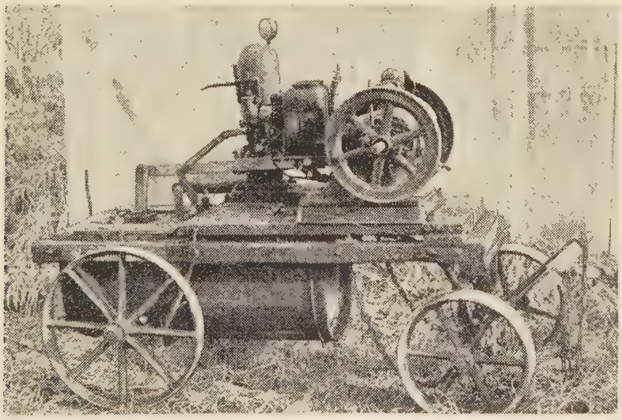
This machine developed 250 lb per square inch and kept two men spraying. It had an output of 300 gallons per day and therefore was a vast improvement on hand-operated outfits, which relied on the strength and energy of the operator to keep up reasonable pressure.

These power-driven outfits were used by only one or two of the larger growers during the next few years. Spraying of most orchards was still being carried out with hand-operated pumps.

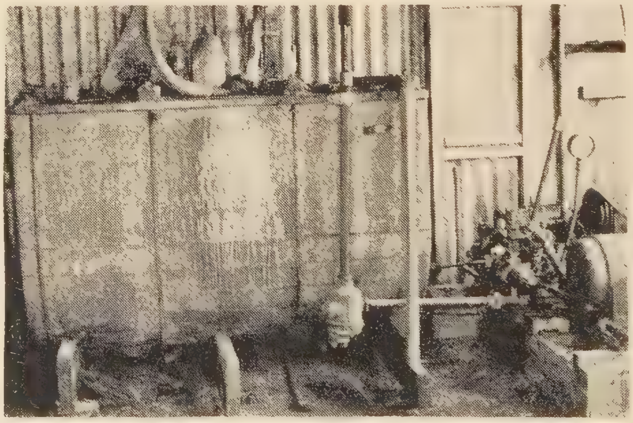
In 1912 the small hand-operated portable outfit became popular. The first sprayer of this type was "Prices No. 2 Simplex" pump with a 12-gallon tank. Though two men were needed to operate these units, they were not expensive and suited the small grower of that period. Similar machines are still quite popular with semi-commercial fruitgrowers and glass-house tomato growers, but they are now generally fitted with a power pumping unit, which enables one man to operate them.

During the next 15 years power outfits became more common in the majority of the larger orchards. The only alteration in these machines was the fitting of larger vats and much more powerful engines and pumps. Spray pressures were gradually increased as the years passed and pumps were modified to belt or chain drive instead of being coupled direct. Single-cylinder pumps were also replaced by two-, three- and sometimes four-cylinder ones, but the actual application of spray remained the same, that is, the operator walked round the tree using either a hand-operated spray rod or gun.

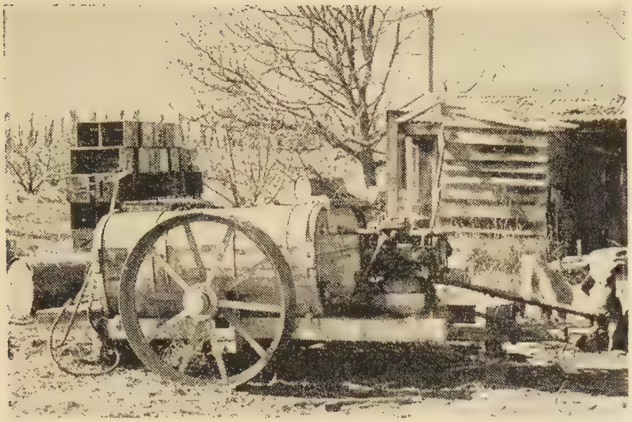
In many orchards spray guns, first used about 1918, were replacing spray rods. The guns were about 18 to 24 in. long and the spray could be altered from a wide to a narrow stream by twisting the handle of the gun as the



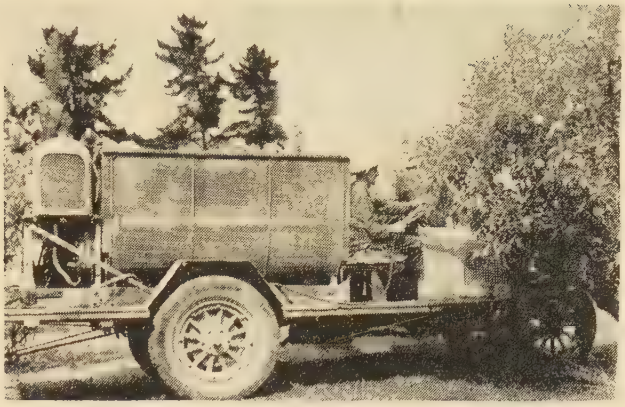
1911: "IHC" spray outfit.



1927: Stationary spray outfit, from which spray was piped to the orchard.



1938: Portable tractor spray outfit.



[*Hassall*

1940: Spray outfit mounted on old truck chassis.

operator continued spraying. The narrow stream was used to reach the tops and far sides of large trees. These guns were suitable only on outfits which could produce more than 250 lb per square inch.

Stationary Plants

In 1927 the first stationary spray system was installed in Canterbury, and within the next few years many growers had installed this type. Stationary outfits were generally installed close to the packing shed, where electric power was usually available and electric motors could therefore be used in place of petrol engines. Spray vats were generally larger (up to 400 gallons) than those used on portable outfits.

Galvanised water pipes buried about 9 in. deep carried the spray throughout the orchard. Taps were fitted at regular intervals throughout the system close to trees so as not to impede cultivation. Long hoses, sometimes up to 100 ft, were used to spray each block of trees round a tap. In most orchards 49 trees were sprayed from each tap, but in some this was increased to as many as 63 trees.

The greatest advantage of stationary plants was that spraying could still be done when the soil was too soft for a portable sprayer to be operated. This allowed better disease control.

The greatest disadvantages of stationary outfits were that pressure losses were considerable, particularly if pipelines were very long and had a small diameter, and spray deposits which accumulated in the pipelines over a period of years were difficult to remove. These deposits impeded flow and caused further loss of pressure.

The pumps installed in most stationary plants had a capacity of 5 to 10 gallons per minute and worked at 250 to 450 lb per square inch. The average output per day for two men appears to have been about 1,200 gallons.

Tractor Outfits

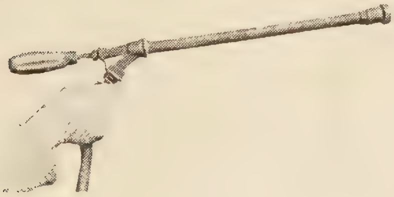
The next revolutionary change in spray outfits occurred in 1938. At this time tractors with power take-offs were becoming popular, and several growers decided to use the tractor power for driving pumps as well as for hauling sprayers. The spray pump was therefore fitted to the front of the outfit and driven direct from the tractor power take-off. In some instances the pump was mounted on the back of the tractor and the spray vat only was hauled. The spray vat agitator was driven from universal couplings from the spray pump.

Another change with tractor-driven outfits was that the trailed portion was mounted on only two wheels instead of the four used for all portable outfits up to this period.

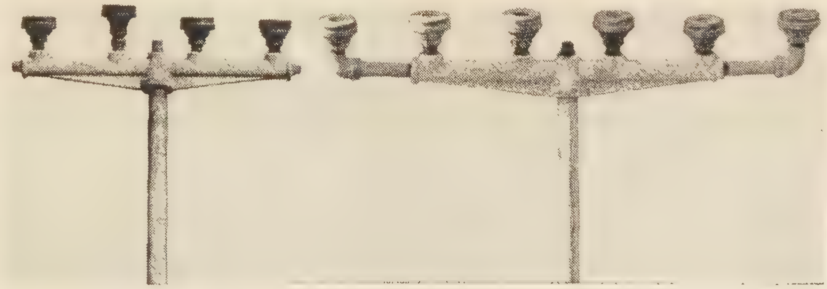
At first operators of tractor outfits still walked among the trees to spray, but before long platforms were built on the back of the equipment to enable two men to spray as the machine was driven slowly along the rows (up to about 1½ m.p.h., according to the capacity of the pump and tree size). Each man would spray half the row nearest his side, generally with a spray broom. Some of the brooms had up to 6 nozzles and were capable of good coverage in the short time the outfit was passing a tree.

Not only did this type of sprayer enable spraying to be done more rapidly, but the work was far easier for the operators. Much larger and higher-pressure pumps than had been used previously were usually fitted. Some growers had pumps with a capacity of up to 20 gallons per minute and 650 lb per square inch. An output of 2,000 gallons per day was possible with some of these machines when operated with a tractor driver and 2 men spraying.

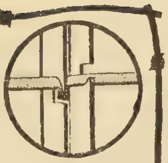
In 1940 one grower built a spray outfit with a 400-gallon vat on an old truck chassis. The chassis was shortened to make it more manoeuvrable in the orchard and a second gearbox was fitted to permit very low speeds. Its slowest speed was only about ¼ m.p.h.



1918: Spray gun.



1938: Four- and six-nozzle brooms.



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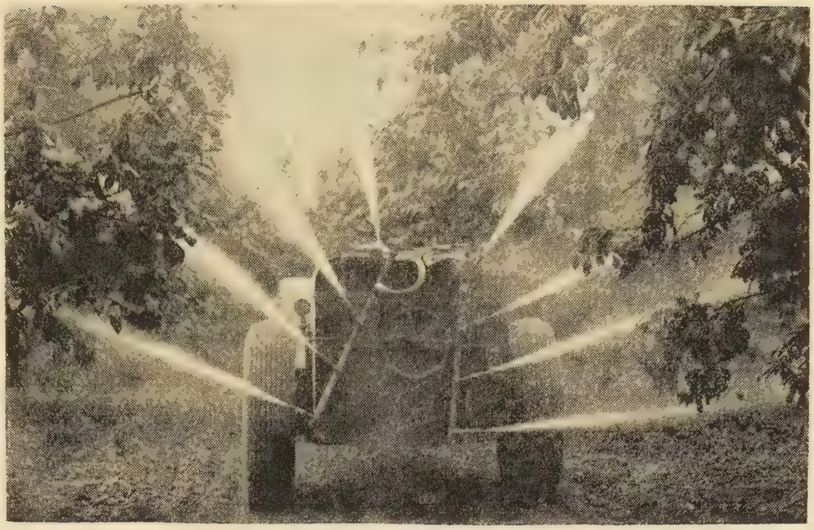
At first the spray pump was mounted in front and driven from the front end of the crankshaft, and spraying was done from the ground. Later the pump was mounted on the back of the outfit and driven from a separate motor. Spraying was then carried out from the truck by two men, one on the front near the steering wheel and one at the back.

The 8-gallon-per-minute pump delivered the spray through guns at 300 to 400 lb per square inch, and the machine had an output of about 2,000 gallons of spray per day. With it spraying time in the orchard was reduced from about six to two days.

Over the next few years most growers purchased or built fairly large and high-powered equipment, which enabled them to reduce spraying time considerably. Most outfits required two or three operators, a disadvantage for the smaller grower who did not employ permanent labour.

Automatic Sprayer

About 1949 a local grower built an automatic sprayer with which one man could do the work formerly done by three men. Though the spray vat held only 200 gallons, the pump had a capacity of 20 gallons per minute. This outfit was drawn by a tractor and the pump was operated from the power take-off. Spraying was carried out by eight short, adjustable spray guns fitted to two oscillating arms at the back of the outfit. These arms moved up and down as well as backward and forward as the machine was drawn slowly along the rows. Only half of each tree was sprayed as the machine passed, the other half being covered when the outfit passed along the next row. This method of spraying half of each tree at a time was also used on all outfits on which the operators rode.



1949: Automatic oscillating spraying unit.

As the daily output of this automatic sprayer with one man was about 3,200 gallons, it saved the grower a considerable number of man days in a season.

Revolutionary Type

The most revolutionary sprayer ever to be used in Canterbury began operating in 1950. It was also much larger and had a far greater output than any previous machine. It was known as the "Bean Speed Sprayer".

The spray vat had a capacity of 420 gallons and the output was sufficiently great to empty this in from 12 to 15 minutes; therefore with one operator its output was about 7,000 gallons per day.

The pump, which delivered the spray to any number up to 30 spray nozzles on each side and near the back of the outfit, worked at only 55 lb per square inch and was of the centrifugal type. Up to the time that this machine began operating spray pressures had been gradually increasing and some growers had equipment which produced up to 650 lb per square inch. As this new machine used air pressure to drive the spray to the trees, a high-pressure pump was not required.

A large fan (29 in. in diameter) at the end of the machine was driven at 2,400 revolutions per minute by a 75 h.p. petrol engine. This fan created a 100 m.p.h. wind into which the 60 nozzles delivered the spray. The wind, which was laden with spray from the nozzles, was directed on to the trees from both sides of the outfit as it moved along the rows at from 1½ to 3½ m.p.h. according to tree size.

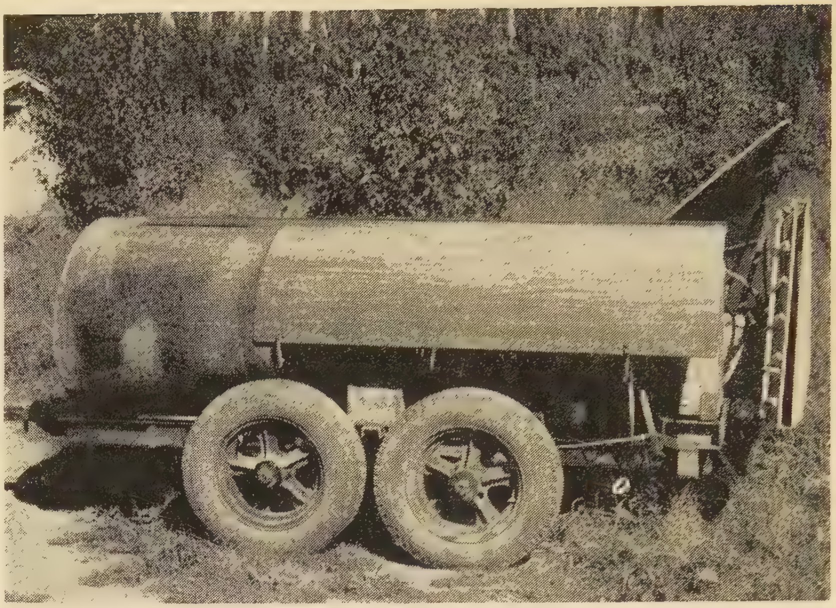
Spray coverage with this machine was excellent, as the wind pressure broke up the spray into minute droplets and they were carried to all parts of the tree in the air stream. One or both sides of the machine could be worked as required from the driving seat. The sprayer was also fitted with an exhaust-type refiller worked from the motor, which enabled the vat to be filled in two to three minutes.

Because of its high cost a machine such as this could be used economically only by large growers. Smaller growers still relied on spraying by hand from power-driven outfits until 1954, when another revolutionary type of sprayer was introduced.

Semi-concentrate Sprayer

This latest machine, the semi-concentrate sprayer, though very small compared with the speed sprayer, also used air to drive the spray into the trees. In addition, instead of using

1950: "Bean Speed Sprayer".



1957: Double-sided semi-concentrate sprayer.

large quantities of water as a carrier for the spray materials it was able with only a quarter of the amount of water used by any previous sprayer to cover an acre of fruit trees, though the same amount per acre of most spray materials was used. For instance, with the old methods of spraying 1½ lb of lead arsenate or DDT was used to 100 gallons of water, and about 320 to 400 gallons of spray was required to cover an acre of trees. In the semi-concentrate machine 6 lb of lead arsenate or DDT per 100 gallons of water was used and about 75 to 90 gallons of spray per acre of trees was applied.

The vat on this machine holds only 150 gallons of spray, but this is sufficient for about 2 acres of trees. Spraying time for each vat is generally about one and a half hours; therefore one man operating this type of sprayer can cover up to 10 acres of orchard in an eight-hour day.

The pump on the semi-concentrate sprayer is much smaller than those used on the older types. Its working pressure is 250 lb per square inch and it delivers the spray into the air stream at the tail fin through seven very fine tungsten disc nozzles.

An axial flow, multi-blade fan travelling at 3,350 revolutions per minute is driven from a four-cylinder car engine by a series of V belts. The fan delivers the air at about 130 m.p.h. through a tail fin at only one side of the machine; thus only one half of a row can be sprayed at a time. Travelling speed of this sprayer ranges from 1¼ to 1¾ m.p.h. according to tree size and the amount of foliage to be covered.

One of the outstanding features of the machine has been that it will do satisfactory work when it would be a waste of time and materials to spray with the older-type outfits. For instance, semi-concentrate machines have been used quite satisfactorily in the very early morning, late at night, and sometimes throughout the night. This is possible because the air flow is sufficient to blow any surplus moisture off the trees, and the spray particles are so fine that they dry very quickly without run-off. Being able to use these sprayers under such conditions, and especially when weather is dull with occasional light showers, enables growers to secure good disease control.

The latest improvement to semi-concentrate sprayers is re-designing of them to take a double-sided tail fin and set of nozzles, thus enabling spray to be delivered from both sides. This has reduced spraying time to about half that with the earlier, one-sided unit, and up to 18 acres can be covered in a day by one operator. Growers are now able to do their spraying with one man, whereas with their old machines two or three men were required. At the same time spraying time has been reduced in many orchards.

During the first 50 years of orchard spraying in Canterbury the method of applying the spray was substantially the same. Comparatively recent use of air plus water as in the semi-concentrate machine has been the first real change in technique.

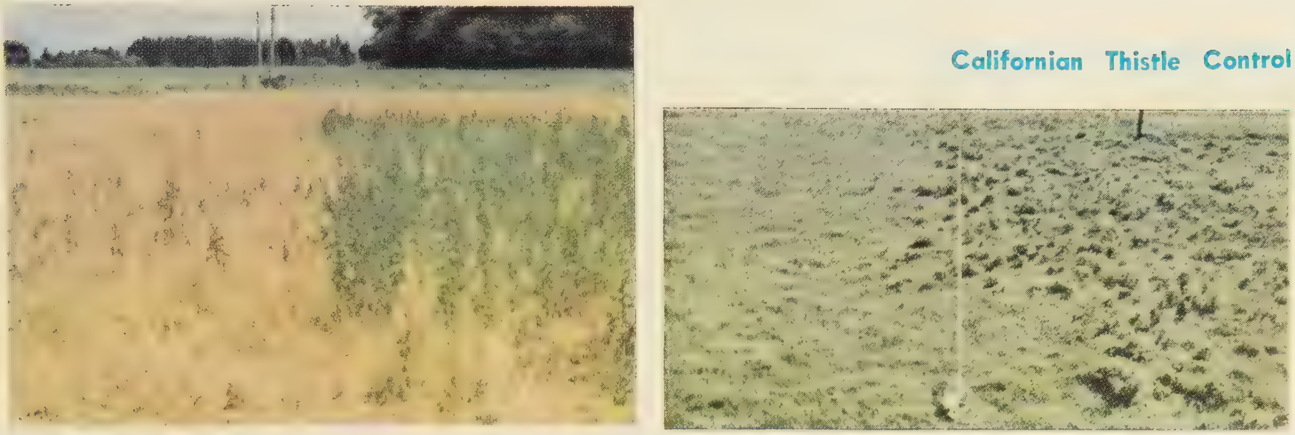
Looking back it is difficult to see how growers secured even reasonable control of pests and diseases with the early equipment. No doubt the standard of disease control has become higher as improvements have been made to spraying equipment, but even today with the most up-to-date machinery and better spray materials disease control can be difficult during bad weather.

Development in 63 Years

THERE is no doubt that improvements in spraying equipment have been far greater than for any other type of machinery used on orchards. The following figures of approximate output for the various sprayers are interesting when it is realised that at present growers must apply from eight to 10 sprays each season to produce clean fruit:

Type of sprayer	Gallons per day	Acres per day	No. of men
1895 Hand syringe	80	⅕	1
1896 Bucket pump	80	⅕	1
1909 Barrel pump	100	¼	2
1911 Motor-driven pump	300	¾	2
1927 Stationary outfit	1,200	3	2
1938 Tractor-driven outfit	2,000	5	3
1940 Truck chassis mobile outfit	2,000	5	2
1949 Oscillating arm mobile outfit	3,200	8	1
1950 Speed sprayer	7,000	18	1
1954 Semi-concentrate	750	9	1
1957 Semi-concentrate double-sided	1,350	16	1

Californian Thistle Control



▲ Californian thistle may be controlled by spraying new pasture with MCPB or 2,4-DB. The above illustrations show sprayed (left) and unsprayed (right) portions of a pasture sown in March 1957. The spray was applied a month later and repeated in December 1957. The left-hand illustration, taken in January 1958, shows a few Californian shoots which survived the initial treatment or came up later. These are dying from the December treatment. The illustration on the right, taken in May 1958, shows a complete clean-up of the thistles after the re-treatment. In the earlier stage the Californian thistles stopped on a straight line dividing the sprayed and unsprayed plots, but after a year there was a gradual spread from the unsprayed area on to the clean pasture.

Weeds in New Pastures

RESEARCH work is continually being carried out by the Department of Agriculture to find out whether there is any practical application for new weedkillers developed overseas in dealing with weed problems in New Zealand. One example of the application of a recent discovery is the use of butyric acid hormones for the control of weeds in new pastures. This was dealt with by F. B. Thompson, Principal Scientific Officer, Department of Agriculture's Rukuhia Soil Research Station, Hamilton, at the 1958 Ruakura Farmers' Conference Week. An adaptation of the paper he presented, brought up to date, follows.

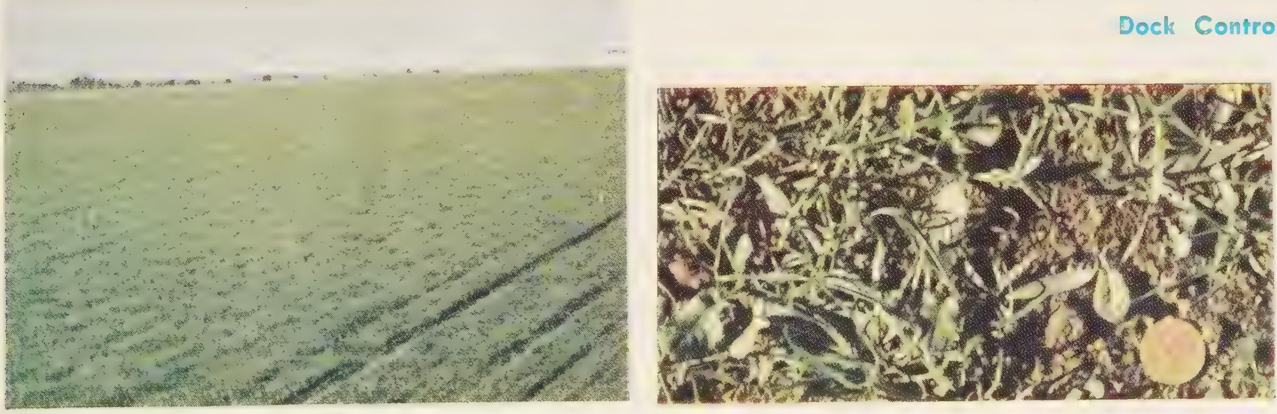
NEWLY sown pastures are often very badly infested with dock seedlings or young shoots of Californian thistles. Both weeds are difficult to eradicate once they are well established in mature pastures, but they are easily killed if sprayed when they are small, as in a new pasture. This method of attacking these weeds has been available to farmers only in the last year or so because the older hormone weedkillers caused too much damage to the seedling clovers to enable them to be used on newly sown pastures.

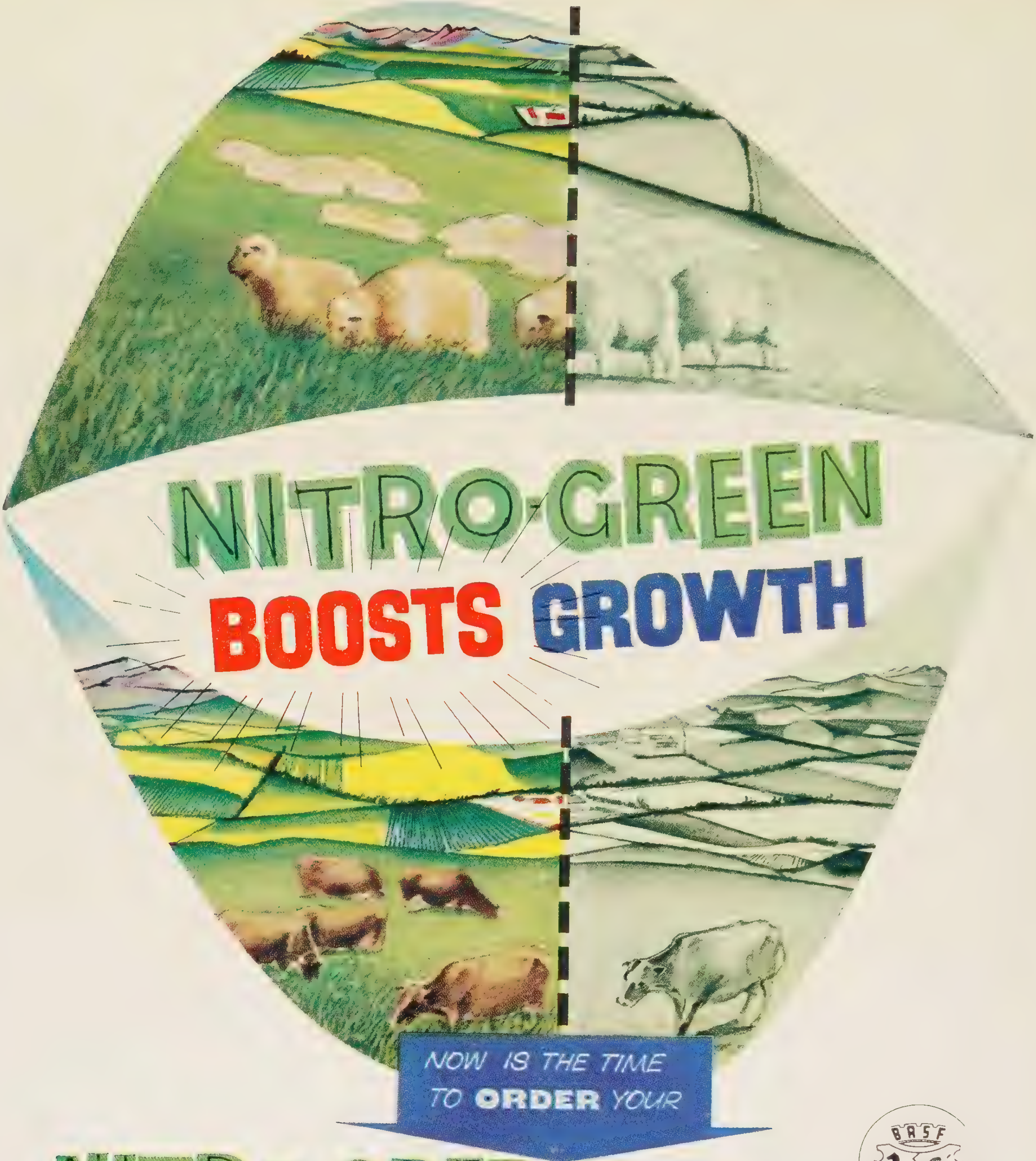
However, other hormones are now available which have very little effect on the young clovers and can be safely sprayed on new pastures provided certain precautions are observed. These materials are the butyric acid hormones which are called MCPB and 2,4-DB to distinguish them from the acetic acid compounds MCP and 2,4-D, which have been in common use for a number of years.

The main points to consider when selecting a weedkiller are what material to use, how much, and when to apply it. Either MCPB or 2,4-DB may be used on weeds in new pastures. 2,4-DB is slightly more expensive per unit of active ingredient (or, as we usually call it, acid equivalent), but it is slightly better than MCPB on most weeds at equal rates of acid equivalent. Therefore slightly less 2,4-DB may be used, which compensates for the difference in price of acid equivalent, so that the cost per acre is about the same. On this basis applications of 1½ lb acid equivalent of

▼ A general view (left) of a pasture 8 weeks after sowing. Close examination (right) of the less dense portions showed that there were numerous dock seedlings. These were killed by spraying at this stage.

Dock Control

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MCPB or 1¼ lb acid equivalent of 2,4-DB are about equal and are the appropriate quantities to apply. If there are only annual weeds in the pasture, the amount of weedkiller could be reduced slightly. There is little to choose between the two materials.

The trade names under which the materials are available, the pounds acid equivalent per gallon, and the pints required per acre to give 1½ lb of MCPB or 1¼ lb or 2,4-DB are:

Trade name	lb acid equiv. per gal.	Pints per acre
MCPB		
"Bexone"	4	3
"Elliott's MCPB 40"	4	3
"IW MCPB"	3	4
"Legumex M" ..	3	4
"Shell Weedkiller P"	3	4
"Tropotox"	4	3
"Yates' Reliable MCPB"	3	4
2,4-DB		
"Elliott's 2,4-DB" ..	4	2½
"Embutox"	4	2½
"IW 2,4-DB"	2½	4
"Legumex D" ..	2½	4
"Plant Protection 2,4-DB"	4	2½
"Shell Weedkiller L"	2½	4
"Yates' Reliable 2,4-DB"	2½	4

The principal rules on when to apply the materials are:

1. Spray any time after the clover seedlings have produced two trifoliate leaves. Clover seedlings first have two fleshy cotyledons, then a single segment leaf on a long stem, and then the typical three-segmented (trifoliate) clover leaves. Spraying before the second trifoliate leaf appears may cause damage to the young clovers.
2. Avoid spraying immediately before rain.
3. Do not delay spraying too long, because the weeds may become too big or covered by the young grass.

A good general rule is to spray as soon as the second trifoliate leaf has appeared on the average clover plant, or as soon as there is complete ground cover of pasture species and weeds. This is about 5 to 7 weeks after sowing.

The volume of water per acre is not critical and 15 to 25 gallons per acre according to nozzle size and tractor speed are convenient.

In the past farmers have been advised to avoid cutting up Californian thistle roots during cultivation when preparing a seedbed, because each piece of root is liable to produce a new plant. The position is changed if it is intended to spray a new pasture, because it is then desirable to cut the roots into short lengths to make all dormant buds produce shoots. The spray treatment kills these shoots and short lengths of root below the ground, but long lengths of root are not killed. Any dormant buds on the latter may then produce shoots and there is another crop of Californian thistles.

If by cutting the roots every dormant bud could be induced to shoot and the shoots were killed by the spray, eradication would be complete with a single treatment, because there would be no more live buds left. It is most unlikely that this ideal situation would arise in practice and one or more follow-up sprayings may be necessary to deal with shoots which appear later. These could be due to shoots coming from roots below the depth of cultivation.

In dock-infested areas, in addition to thousands of dock seedlings in a young pasture, there are many regrowths from old roots not killed by the cultivation. MCPB and 2,4-DB will kill the seedlings and regrowths from small pieces of root, but larger regrowths from bigger roots usually survive the treatment. Therefore the extent to which docks are eliminated from an area depends on the degree to which the old dock roots are cut up, killed, or removed in preparing the seedbed.

In the dock and Californian thistle trials at Rukuhia regrowth from old roots started shortly after the initial cultivation. There was some delay before sowing, and root regrowths were through the ground shortly after sowing. The regrowths thus had a big start on the sown clovers. In the dock trial, in particular, some regrowths were too big before the clovers were large enough to spray. Therefore I consider it desirable to reduce to a minimum the time between the initial cultivation and sowing of the pasture, unless a fallow during the hot weather is used to kill the old roots.

Good control of Californian thistle was obtained at Rukuhia in a pasture sown on 25 March 1957 and sprayed on 27 April. Californian thistle shoots were still coming through the ground at the time of spraying, and it would probably have been better to have delayed the spraying. However, the largest thistle plants at that stage had reached a diameter of over 12 in. and it was feared that they would be putting on too much new growth if they were not sprayed immediately.

There was some reinfestation in spring, but the sprayed plots were very much cleaner than untreated areas. A re-treatment was applied in December 1957, and except for a few isolated Californian thistle shoots, the plots were still quite clean in December 1958.

This paddock was sprayed 12 months before the photograph was taken, several weeks after the pasture was sown. The pasture is weed free except on the unsprayed strips (right), which are a mass of weeds.

In the initial stages of the trial the Californian thistles stopped on a straight line dividing the sprayed and unsprayed plots. However, by autumn 1958 the thistles had spread about 2 ft over the line and by the following summer this spread had, in places, increased to 12 ft. To maintain the advantages of the initial treatments it is necessary to treat all shoots which subsequently appear; otherwise the whole area is likely to become reinfested.

The effective control of docks by spraying new pastures with butyric acid hormones has been demonstrated repeatedly. An example may be seen in a paddock at Ruakura sown in March 1957 and sprayed a month later to control seedling buttercups. The striking feature is that in the following year the unsprayed strips could be traced by the infestation of docks, whereas the sprayed portions were practically weed free.

The dock growth on the unsprayed strips was still conspicuous at a recent inspection, nearly 2 years after spraying, compared with the clean, sprayed areas. It would be difficult to eliminate completely the mature docks at this stage, yet they were destroyed so easily and so completely at the seedling stage.

Weed infestation in new pastures is often more extensive and more varied than is first realised. Land cress, for example, could easily pass undetected as seedlings in a new pasture, and cause much trouble on a dairy farm at a later stage through taint in the milk. Land cress, like docks, could be easily killed as seedlings, but control is more difficult when the plants are mature.

In conclusion, I suggest that the spraying of new pastures should become almost standard practice, particularly on dairy farms.

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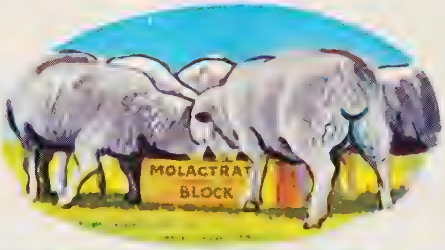
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WEED IDENTIFICATION AND CONTROL

By L. J. MATTHEWS,
Weeds Research Officer,
Department of Agriculture,
Wellington

This is one of a series of articles illustrated in colour to appear in the "Journal" from time to time in which identification and control of various weeds will be discussed.

The results of a basal application of 2,4-D. Mature trees are best dealt with by this method.

WILLOWS belong to the family Salicaceae, as do poplars. Willows have alternate, stipulate leaves, and the male and female flowers are on different plants. Three species are important as weeds in New Zealand: crack willow (*Salix fragilis*) is most abundant and grows by streams throughout New Zealand; weeping willow (*S. babylonica*) has the same distribution but is less abundant, and pussy willow (*S. capraea*) grows in only a few areas as a weed.

ALL three species are valued as ornamental plants, the large catkins of pussy willow being particularly attractive. Weeping willow has long, slender, pendulous branchlets, and crack willow erect or spreading ones.

Control

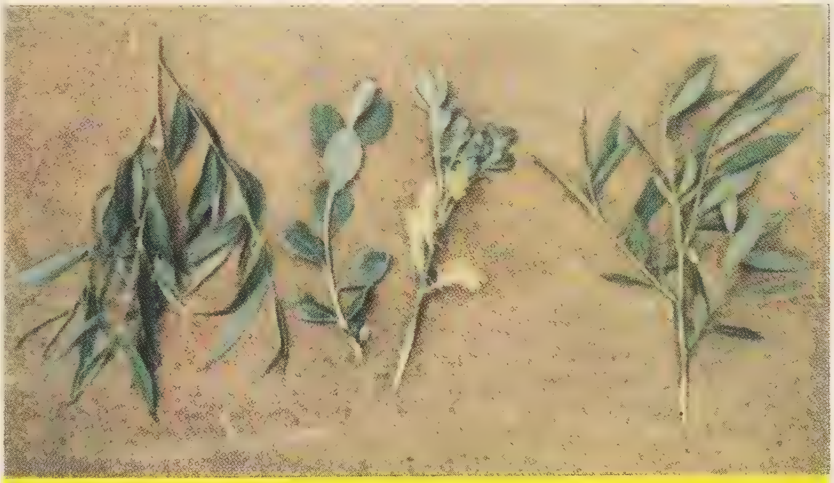
Two main methods of chemical control are available.

Overall Spraying

Ground application is suitable for pussy willows and small crack and weeping willow trees. The application should be made when the willows are in full leaf. A concentration of 1,000 to 2,000 parts per million of 2,4-D ester should be used (1 to 2 lb acid equivalent in 100 gallons of water). The spray particles should be fine to give maximum spray retention.

Aerial application: The quantity of water can be reduced to 15 to 30 gallons per acre, and rate of applica-

▼ Types of willows.



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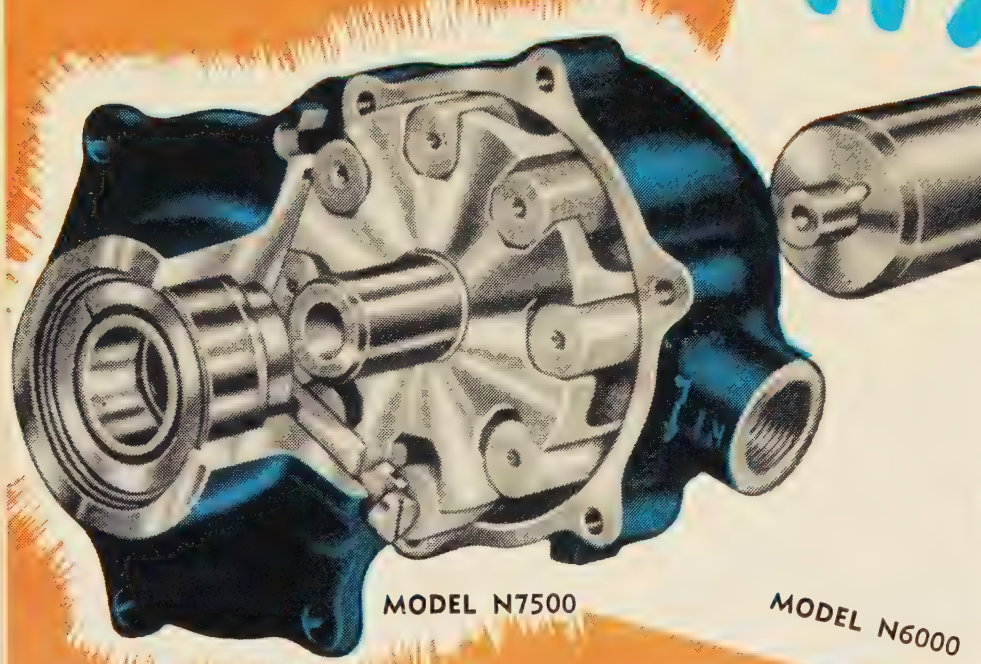

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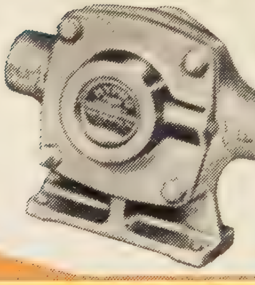

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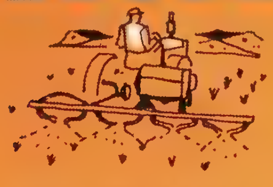

INSECT CONTROL

Both pumps have ample volume and pressure for insect spraying through either the boom type sprayer, or cluster jet equipment. Use it to spray weeds in pastures and to control insect pests on crops.

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tion should be 2 to 3 lb acid equivalent per acre. Owing to the irregular shape of infestations and the type of country inhabited by willows, application by helicopter is preferred. For mature pussy and crack willow trees results of overall application are poor. At least three applications are required, and if large droplets are used, pussy willows are not greatly affected. Mature trees are best dealt with by bole application.

Bole Application

In bole application 2,4-D is applied to the bole of the tree. Willows with smooth green bark at the base of the bole such as young trees of crack and weeping willows and pussy willows at all stages of growth are controlled by the application of 2,4-D oil concentrate in diesel fuel oil.

The bole should be treated to a height equal to twice the diameter of the tree from ground level upward. A suitable concentration is 1 lb acid equivalent of 2,4-D oil concentrate in 10 to 20 gallons of diesel fuel oil. From 2 to 3 fl. oz. should be applied to trees of 2 to 3 in. diameter and more to larger trees.

Care should be taken to ring the tree completely on green bark, as control is poor if dead wood on part of the bole is sprayed.

Once the trees have developed thick, corky bark the hormone-diesel fuel oil mixture fails to penetrate adequately unless application rates are heavy. The most suitable method of dealing with such trees is to frill the trees with a sharp curved instrument such as a heavy knife and apply the hormone and diesel fuel oil concentrate to the frill.

The frill should be made so that the underlying wood is exposed but not damaged. The frill should be V shaped and horizontal to hold the weedkilling preparation, which can conveniently be applied with a brush. In all cases the frill must encircle the tree completely and must be on green wood. A suitable concentrate is 1 lb acid equivalent of 2,4-D oil concentrate in 5 gallons of diesel fuel oil.

If the trees have been felled, the same mixture can be painted on the freshly cut surface and sides of the stump. Where possible the tree should be cut off close to the ground. If this is not possible for mature trees, the bark should be stripped back before the mixture is applied. Individual suckers should also be treated.

The Planting of Farm Shelter

By G. B. HADDOW,

Instructor in Agriculture, Department of Agriculture, Auckland

THE planting of *Pinus radiata, Pinus muricata*, or *Cupressus macrocarpa* in single rows so that they lose their bottom branches is the common fault which has brought farm shelter into disrepute.

WHEN the protecting fences are placed too close to the row of trees, stock destroy the lower branches and the trees become bare and draughty at the base. Large trees must be given enough room to retain their lower branches. Pines and macrocarpa can be made to retain their lower branches if a wide space is allowed between fences; but few farmers are prepared to give up a piece of land nearly half a chain wide for one row of trees.

Trees should be planted at 8 to 12 ft apart in the rows, depending on the final size the trees will grow. Where single row shelter is required the use of bamboo, *Chamaecyparis lawsoniana*, boxthorn, or Lombardy poplar associated with eleagnus, which produce excellent bottom shelter, is suggested.

Gully Planting

The planting of a row of trees in a gully or on a sideling can give good ground shelter in spite of the trees being bare at ground level. On farms intersected by streams it is better to plant a block of trees on the banks of the streams, even though they do not always run exactly in the right direction for the best shelter.

Gully planting provides shelter for the rest of the field, divides mowable land from land which is too steep to mow, and helps to control weeds. The planting of gullies in farm woodlots comprising eucalypts or *Pinus radiata* can provide valuable timber as well as shelter. The use of willows in such places is not advisable because the roots can cause trouble by choking drains.

Overcrowding in Shelter Belt

Another mistake is the overcrowding of trees within a shelter belt. The planting of Lawson cypress or macrocarpas too close to a line of pines leads to the smothering of the slower-growing trees by the pines. Smothered trees grow in such a spindly way that when the pines open up they provide no bottom shelter.

A further mistake is the severe trimming of macrocarpa or pines. These trees will stand moderate annual trimming.

Farm forestry associations in New Zealand afford farmers the chance of studying well planned farm shelter and woodlot plantings during field days in their districts.

New Zealand Weed Control Conference at Tauranga

THE 1959 New Zealand Weed Control Conference will be held from 7 to 9 July at the Town Hall, Tauranga. The programme is as follows:

7 July—"Weeds of the Bay of Plenty" (A. V. Allo); "Effect of Dalapon and Amitrol on Various Grasses" (A. Thompson); "Lucerne Tolerance to Dalapon" (F. A. H. Meeklah); "Some Aspects of the Use of Dalapon in Grassland Improvement" (H. Lawson); "Use and Limitations of Chemical Ploughing" (L. J. Matthews).

8 July—"Review of the Use of Phenoxybutyrics in New Zealand" (J. N. Fitzgerald); "Use of Seeding Rates and Weedkillers for Control of Weeds in Newly Sown Pastures" (N. A. Cullen); "Gorse Control on Unploughable Hill Country" (J. D. Currie); "The Gorse Seed Problem" (G. R. Moss).

A field trip will be held in the afternoon to inspect local trials on a logarithmic sprayer, weed control in drains, and the tolerance of grasses to weedkillers.

9 July—"New Aspects of Chemical Control of Weeds in Drains" (G. L. Banfield); "Manchurian Rice Grass" (E. H. Arnold); "Barley Grass Control" (D. E. Merry); "The Significance of Weed Seeds in Agriculture" (G. S. Harris); "Absorption and Translocation Studies Using Labelled Herbicides" (O. Leonard and J. S. Yeates); "Weed Control in Fodder Crops with Monochloracetate" (F. B. Thompson); "Weed Control in Berry Fruits" (J. Porter).

Care of Livestock during June

Contributed by the Animal Research Division

WINTER FEEDING OF DAIRY COWS

EXPERIMENTS have shown that cows fed well during winter will produce from 26 to 63 lb more butterfat in the following lactation than those which have been poorly fed during winter. These results were obtained when both groups were well fed after calving. It is therefore very important to feed the cows well from now until calving, so that they will have ample body reserves to draw on during the first two months of the lactation.

It is difficult to build up these body reserves with even liberal amounts of hay and/or silage unless some grass is also available throughout the dry period. With a portion of the farm closed for autumn-saved pasture for feeding after calving it is particularly important to graze the rest of the farm under a controlled rotational grazing system with adequate spelling between grazings, both to ensure continued grass growth during winter and to ration what grass is available throughout this period. Where subdivision is inadequate for this purpose break grazing with the electric fence is essential. Since cows will eat grass in preference to most other feeds, they should be fed as much hay as they will clean up in addition to 20 lb of silage per cow per day.

LIVER FLUKE IN SHEEP

In areas where sheep become infested with liver fluke flocks should be drenched now. The only effective drug is carbon tetrachloride, which should be mixed with four times its volume of liquid paraffin. The dose of the mixture is 5 c.c. for sheep of all ages, and 1 gallon is enough for about 900 sheep. Further information about liver fluke in sheep and cattle will be found in Bulletin No. 248, which is available from the nearest office of the Department of Agriculture.

WORMS IN LAMBS AND CALVES

Worms are sometimes still troublesome in May and June, and if lambs or calves are not doing well, they should be drenched with fine-particle phenothiazine at the full dosage rates recommended by the manufacturers. Further information about worms and drenching will be found in Bulletins No. 171 and No. 189, which are obtainable from the nearest office of the Department.

LICE ON POULTRY

Poultry lice can cause considerable loss of condition in birds and reduced egg laying. To control these parasites a fine trickle of 40 per cent nicotine sulphate should be run along the perches on a calm night before the birds go to roost. A second treatment should be given 10 to 14 days later to kill any lice hatched out from nits or lice eggs.

RICKETS IN LAMBS

Rickets in lambs occurs frequently during winter in Canterbury and other South Island districts. It is also occasionally seen in the North Island. Lambs wintered on green oats or barley are most susceptible, but other green feed or good pasture may also produce the condition. It can be prevented by giving one dose of 25 m.g. of calciferol (a vitamin D concentrate) at the beginning of winter. This preparation can be bought dissolved in olive oil with full instructions for use. It is unlikely to be beneficial during autumn and the best time to administer it is about the end of May.

PIG PRODUCTION

Sows and store pigs should be fed on roots, grass, and up to 1 lb of meat meal or other high protein feed daily. Grazing pigs should not be confined to small paddocks during winter. The use of large grazing areas will reduce pasture damage considerably. Warm accommodation is essential for winter store pigs to avoid losses and maintain steady growth. Early-farrowing sows should be put in their farrowing quarters and fed 3 to 4 lb of meal daily. After farrowing they should be fed 4 gallons of milk plus 2/3 gallon for each piglet suckled. Where insufficient milk is available meal should be used to replace the milk in the ratio of 1 lb of meal to 1 gallon of milk. Constipation, which is common in late pregnancy, can be avoided by feeding ½ lb of bran daily or 4 oz of molasses two or three times during the last 10 days before farrowing.

GOITRE IN LAMBS

Where pregnant ewes are wintered on swedes, turnips, rape, chou moellier, or kale for several weeks before lambing, goitre, sometimes accompanied by high death rates, may occur in their lambs. This can be prevented by giving the ewes extra iodine during the last two months before lambing.

If iodised salt licks are used, these should contain 5 oz of potassium **iodate** to the ton. However, it is better to dose the ewes with iodine contained in a drench. For this purpose potassium **iodide** is a safe and convenient compound because it dissolves easily in water. Sufficient drench for 160 doses is made by dissolving 1½ oz of potassium iodide in 1 gallon of water. Each ewe should receive a 1 fl. oz. dose of the resulting solution about two months before lambing and a second similar dose about one month before lambing.

Because large amounts of iodine compounds are poisonous, the strength of the solution and the two doses recommended should not be exceeded.

BEEF HERDS

Beef herds have probably been worked to a hard store condition. From now on they should be slowly improved in condition. Pastures which have "got away" under lax grazing by hoggets are ideal for this purpose. Crops and hay if available may be rationed out to the cows. On dirty faces feeding out of hay is best, as it leads to both seeding of the pasture and crushing of unwanted growth through trampling.

Erosion on Hill Country; Winter Pasture Management

Seasonal Notes by the Extension Division

INCREASING attention is now being given to the control of erosion on hill country. Much of this can be reduced by pasture improvement, which decreases both run-off and soil movement. Pole planting of slips and gullies will do much to increase stability preparatory to or in association with grassing down and is also valuable for the prevention of erosion along water channels where water concentrates during heavy storms.

PLANTING POLES FOR SOIL CONSERVATION

JUNE and July are the best months for planting poplar and willow poles for erosion control. Poles should be 10 to 12 ft long with a diameter of 3 to 4 in. at the base. Where sheep only are being grazed smaller poles can be used. Side branches should be trimmed off and all cuts should be clean so that the bark is not damaged.

Best material can be obtained from young, vigorous shoots of trees stumped or lopped some years before or from stools grown in a small nursery. The latter method has the advantage that nurseries can be established close to the area where the poles are required. Poles should be planted as soon as possible after cutting. Where delay is unavoidable the poles should be partly immersed in water.

If poles are to withstand high winds, deep planting (2½ to 3 ft) is necessary. Most roots will be formed in the top 18 in. and to increase root development it is advisable to slice a strip of bark from two sides of the pole at this level. Moisture conditions can be improved when a shallow depression is left round the pole in which run-off water can collect.

—*C. W. S. VAN KRAAIJENOORD, Palmertson North*

* * *

CARE OF AUTUMN-SAVED PASTURE

PROBABLY the most common error in the management of autumn-saved pasture on dairy farms in the North Island is to permit it to become too long. The normal damp conditions which prevail in late autumn and winter will very soon begin to rot grass that is too long.

In years when growth is abundant it is preferable to ration graze the paddocks with the dry stock if they are ready before the milking herd or ewes and lambs are available. Where growth has been vigorous a strong root system will provide a quick recovery and soon restore an adequate ground cover.

When growth is slow or severe weather causes a check in growing conditions rust quite often attacks the grasses. While this fungus is present no useful growth will be made. The only way to correct the trouble is to force stock to graze the paddock and allow fresh growth to start.

—*B. T. JORDAN, Dargaville*

* * *

WINTER PASTURE MANAGEMENT

SEVERE grazing of pasture during winter, particularly in areas where pasture growth is negligible, should be avoided whenever possible. It can result in a weakening of the grass species in the sward and consequently cause slower and later spring growth. Moreover in wet weather damage can be accentuated by poaching.

The ideal system of management for pastures during this period is winter spelling. Grasses are maintained in a reasonably leafy state and are thus able to develop a vigorous root system. Growth in spring will therefore be earlier and a denser, high-producing sward capable of withstanding dry conditions will result.

Feeding off in breaks with an electric or netting fence is recommended for pastures which have been autumn saved. A similar system can be used for a vigorous autumn-sown pasture.

Where there is no alternative to grazing pastures, because of failure of a winter feed crop or for some other reason, a system of rotational grazing of pastures is to be preferred to set stocking.

—*J. L. SYMONS, Waimate*

* * *

WINTER GRAZING OF LUCERNE

UNTIL recently it was accepted that lucerne would not stand grazing and its main purpose was to supply hay and silage. Today, however, it is normal practice to graze lucerne stands and with reasonable management little damage is caused.

In pure stands winter grazing is used to control volunteer grasses. In paddocks sown to lucerne-grass mixtures grazing is necessary to maintain a good balance between the grass and lucerne. Previously it was considered good practice to graze stands as late as the end of July to control the grasses without losing the subsequent spring production. However, recent work has shown that a considerable reduction in spring growth results if the lucerne is grazed later than May or June.

This early winter feeding still gives good weed control if stands are grazed hard and will not depress early spring production.

—*P. THAINE, Rangiora*

* * *

ELECTRIC FENCE FOR BREAK FEEDING OF BRASSICA CROPS

ON many farms the electric fence has replaced stakes and netting as the standard method of break feeding of brassica crops. It is cheap, effective, easy to erect, and easy to shift.

For dairy cattle one wire is sufficient, but for sheep two or three wires are used. The bottom wire is usually placed about 9 in. above the ground, the second wire about 9 in. above the first, and if a third wire is used, it is placed about 9 in. above the second.

Where cattle and sheep are run together the top wire of the three can be raised to 18 in. above the second. If two wires are used, both should carry an electric charge, but if there are three wires, the middle wire may be earthed. This gives a greater shock from the live wire to the earthed wire than from the live wire to the ground.

For efficient operation batteries should be kept well charged and the insulators in good repair. Care must be taken to ensure that no leaves are touching the wires to reduce the shock.

Where there is difficulty in controlling sheep and they push through the wires, three wires should be erected and two controllers can be used. One is attached to the bottom wire and the other to the upper two wires. Later, when sheep are trained, one controller is sufficient.

—*T. G. SEWELL, Gore*

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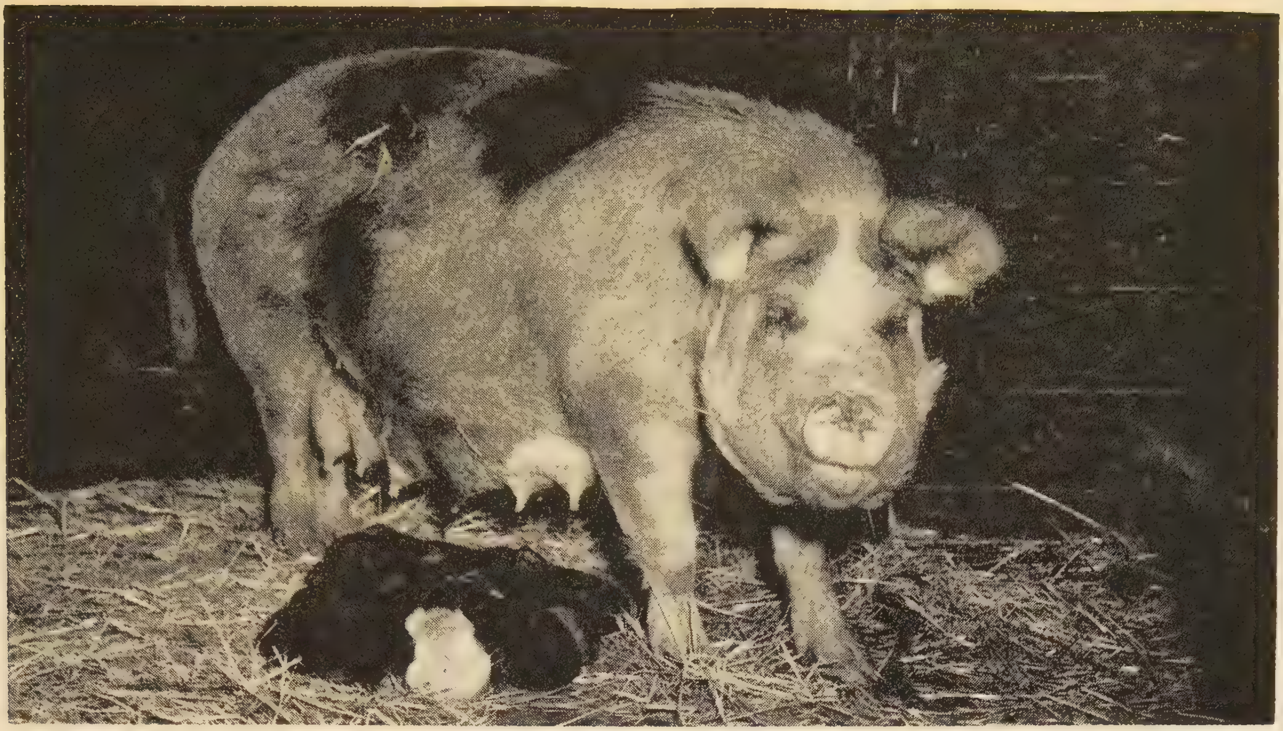

Farrowing Management on the Dairy Farm

NET profit from raising pigs on the dairy farm depends to a very great extent on correct farrowing management. In this article I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington, deals with this important aspect of pig production.

PRICES for pig meat have declined somewhat during the last 12 months, but a satisfactory net profit can still be maintained if management, and particularly farrowing management, is correct.

On a dairy farm where pigs are kept with the object of turning skim milk or whey into a marketable product in the form of pig meat the food supply for the pigs from dairy by-products rises from the end of July or beginning of August to a peak in November and December and then gradually declines until May, when the dairy herd is dried off for winter. On the other hand pig production, as sows farrow every six months, has two peaks of production during the dairying season, and whatever pigs are on hand during winter, when cows are not milking, will have to be fed on feed that is either grown on the farm as crops or purchased.

Arranging Farrowing Dates

Growing crops and purchasing meal both cost money, but skim milk or whey has to be disposed of somehow by the farmer and is virtually of no value unless fed to pigs. Therefore the smaller the amount of home-grown or purchased food used during the season the greater will be the net profit on the pigs.

To achieve this desirable object farrowing dates of sows and production policy must be carefully arranged so that the supply of pigs coincides as nearly as possible with the supply of dairy by-products on which they are fed.

On a home-separation dairy farm, on which the cows calve from mid July to the end of August, every endeavour should be made to farrow all the sows during May and not later than the middle of June. This will mean that these sows will farrow their next litters during November and December if normal weaning at eight weeks is practised. Young sows should always be mated so that they farrow in either May or November. They are then established in a satisfactory breeding cycle that can be maintained for the rest of their useful life. If sows are mated to farrow down in pairs, management is facilitated, because if one of a pair has no milk or loses nearly all her pigs, the other can foster the litter.

The advantages of farrowing at these times are: With litters farrowed in May and early June it costs far less to feed a sow and suckling litter during winter, when little if any dairy by-products are available, than to feed the same number of store pigs. A sow and litter require much less attention in the way of cleaning out than a pen of store pigs, which means less unpleasant work for the owner. A self-feeder in the creep for feeding meal to the suckling litters makes this job quite easy and is most efficient.

When the cows begin to calve from the middle of July onward these litters of pigs are either just weaned or about to be weaned and can consume the skim milk or whey that is becoming available. Though newly weaned pigs may not consume large quantities of dairy by-products, on practically every dairy farm calves are reared each year for replacements and they consume a considerable quantity of skim milk that would otherwise be available to the pigs. The weaned litters are therefore quite capable of dealing with the supply available to them.

As these pigs grow during spring their appetite grows and so does the

TARTAN

topics

Control of Variegated, Scotch, Nodding and Winged Thistles

Products Recommended:

If no clover damage is acceptable:	TARTAN M.C.P.B.
If slight clover damage is acceptable:	TARTAN M.C.P.A.
On mature thistles or if clover damage is acceptable:	TARTAN 2,4-D ESTERS

Dosage Rates:

M.C.P.B.	3-4 pints (1-1½ lbs. acid equivalent) per acre.
M.C.P.A.	1½ pints (¾ lb. a.e.) per acre at small rosette stage. 2 pints (1 lb. a.e.) per acre at full rosette stage.
2,4-D ESTER	2 pints (1 lb. a.e.) per acre for Variegated and Scotch Thistles. Mature plants. 3 pints (1½ lb. a.e.) per acre for Saffron Thistle. 4 pints (2 lb. a.e.) per acre for Nodding and Winged Thistles. 1½ pints (¾ lb. a.e.) per acre for all Varieties at the small rosette stage.

Time of Application:

Preferably small rosette stage, especially for Nodding and Winged Thistles.

GENERAL DIRECTIONS

The Thistles listed are more easily killed when young and flat rather than when older and in stalk. For best control and least clover damage spraying at the small rosette stage is essential. For large mature plants, 2,4-D esters, which are seriously damaging to clover, must be used.

Aerial Application:

Spray in July or early August with 1½ pints (¾ lb. a.e.) of 2,4-D ester mixed with 3-5 gallons of diesel oil per acre. As separation may occur on standing, mix 2,4-D and oil just before use.

Alternatively, 2,4-D, M.C.P.A. or M.C.P.B. may be applied with water at the ground rates recommended in this bulletin.

CAUTION

Variegated Thistles are poisonous and become dangerous at the palatable wilting stage. Keep stock off for about 10 days.

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amount of food available to them; that is, they are growing with the feed supply. This means that to use this supply of feed efficiently these pigs should be taken on to bacon weights with of course the exception of any that show obvious signs of being the early-maturing, rapid-fattening type. These, a few of which are likely to crop up in any litter, should be disposed of as pork, because if they are taken on to bacon weight, they are sure to be overfat.

These baconers will be ready to be sent off the farm during November and December and those from any later farrowing sows up to the middle of January. But the sows that farrowed in May and early June will farrow again in November and December, so that during these two months there will be on the farm baconers from the early litters approaching finished weight and sows with litters as well.

The pig population will therefore be at its maximum when the supply of dairy by-products available for feeding to them is also at its peak, and this is the target that has to be aimed at.

FARROWING MANAGEMENT ON DAIRY FARM

Well arranged farrowing means that litters will be ready for weaning when dairy by-products are in full supply for rearing and fattening.

November and December Litters

A very different situation faces the litters farrowed in November and December. As they grow, instead of the feed supply increasing, it will be decreasing as autumn advances and the dairying season draws to a close. A different policy has therefore to be adopted with these pigs and they should be disposed of as porkers as soon as they are ready.

By the middle of February some of the pigs from the litters farrowed at the beginning of November should be up to pork weight, that is, over 60 lb carcass weight, and finished as far as condition is concerned. The supply of feed from the dairy herd will not have dropped very much by the middle of February, but from then on the decline will be much more rapid. If pigs are disposed of as soon as they are finished at pork weights, the number of pigs on hand will be decreased as the feed supply falls. These pigs should be sent off in small lots each week or as the opportunity offers.

If this policy is continued throughout autumn, the last of the pigs from the summer litters should be disposed of before the herd dries off, and all the pigs produced during the dairying season will have been sold as either baconers or porkers by the time the season is finished.

As the pigs have been keeping pace with the supply of dairy by-products, the minimum amount of home-grown or purchased food will have been used. The greater part of this will consist of meal used for feeding litters of pigs in the creep and up to three and a half months old, which is essential to efficient production, and a small amount of crop or purchased food used for the sows and boar during winter.

In a good dairying season it may be possible to finish all the pigs on hand in autumn without resorting to any supplementary feed. On the other hand in a dry autumn either a home-grown crop or purchased food may have to be used to achieve this result. The amount used will vary with the season's production from the dairy herd. The important point is that these pigs should be finished and disposed of before winter. Store pigs carried through winter require a large amount of feed and the ultimate profit if any on them will be small.

The smaller the amount of home-grown or purchased food used during the season the greater will be the net profit on pigs.

Early Weaning

Early weaning of litters farrowed in May and June can be of considerable assistance in getting all pigs produced away by the end of the dairying season. If a litter farrowed in May

FARROWING MANAGEMENT . . .

Meal is expensive to buy and it pays best to use it in the creep.

is weaned at 14 days old, the sow can be mated again five weeks earlier than if normal (eight weeks) weaning is practised. As a result the next litter will be farrowed five weeks earlier, in October instead of November.

This will make it easier to deal with the peak supply of dairy by-products in November and December, as these October litters will be capable of dealing with far more milk at the peak period than if they had been farrowed in November. There will be less likelihood of baconers from the winter litters being overfed in the final stages of finishing and so becoming overfat. Most important of all, the October litter can be finished as porkers much more easily owing to their being older before the supply of feed from the dairy herd starts to decline seriously in late February. In fact some of these pigs will probably be able to be finished as light baconers if the season is favourable.

Early weaning, however, particularly of May and June litters, requires conditions which are not available on many farms. Any farmer who is thinking of using this system should take care to see that he has the necessary equipment.

The most essential requirement is accommodation. Housing must be good and of such a design that an even temperature can be maintained inside the house. A sleeping kennel is necessary with artificial heating and the temperature in this should be kept at 75 degrees F.

Full details of the methods to be used in early weaning pigs are published in the Department of Agriculture's Bulletin No. 389, "Early Weaning of Pigs", and a careful study of this is recommended before an attempt is made to wean a litter at 14 days old.

Net profits on the pig project on a dairy farm—the return the farmer receives as value for the skim milk or whey used and as a return for his own labour after the cost of all home-grown or purchased food has been deducted—are vitally affected by the organisation of the farrowing dates of the breeding sows on the farm. This will vary somewhat from district to district, but if as a general rule sows farrow about two months before the dairy herd begins to calve, the best results in net return will be achieved. Early weaning of winter litters can be of great assistance, but should not be attempted without the right conditions.

Grading Points for Export Butter and Cheese

Contributed by the Dairy Division

BUTTER-MANUFACTURING companies which obtained an average grade of 93.75 points or more and cheese-manufacturing companies which obtained an average grade of 92.50 points or more during the year ended 31 July 1958 are listed below in order of merit. Of the total listed, the 22 butter factories and 14 of the cheese factories are in the North Island and the remaining cheese factory is in the South Island.

Creamery Butter

Factory	Registered number	Brand	Production	Graded for export	Average grade	Grading port
			tons	tons	points	
United	1,296	Whariti	547	120	94.401	Wellington
Konini	1,203	Konini	1,777	989	94.331	Wellington
Cheltenham	3	Pakeha	1,690	848	94.314	Wellington
N.Z. Dairy (Morrinsville)	415	Anchor	4,459	4,459	94.179	Auckland
N.Z. Dairy (Ngatea)	291	Anchor	3,686	3,572	94.174	Auckland
Wairoa	1,345	Wairoa	514	100	94.158	Napier
Kuku-Manakau	905	Ohau	417	296	94.145	Wellington
Awahuri	664	Red Rose	1,392	579	94.114	Wellington
Te Aroha-Thames Valley	344	Overseas	4,450	3,926	94.110	Auckland
Cambridge	1,239	Cambridge	4,041	2,145	94.024	Auckland
Taihape	1,188	Taihape	172	38	94.002	Wellington
N.Z. Dairy (Paerata)	109	Anchor	2,607	2,448	93.976	Auckland
Levin	910	Lake	2,013	826	93.973	Wellington
Midhirst	110	Rugby	2,164	1,995	93.936	New Plymouth
N.Z. Dairy (Taupiri)	22	Anchor	4,402	2,491	93.909	Auckland
Matakana	1,375	Matakana	680	668	93.894	Auckland
Te Awamutu	397	Lotus	3,197	1,805	93.874	Auckland
Kia Ora	926	Kia Ora	692	242	93.830	Gisborne
Stratford	68	Stratford	2,183	1,869	93.820	New Plymouth
Rangitikei	1,360	Rangitikei	1,105	687	93.809	Wellington
N.Z. Dairy (Mount Eden)	378	Anchor	3,564	87	93.804	Auckland
N.Z. Dairy (Tirau)	95	Anchor	6,131	5,844	93.753	Auckland

Other butter companies whose butter was graded mainly for the local market and for which an average grade of 93.75 points or more was obtained for the combined local and export gradings were as follows:

Factory	Registered number	Brand	Production	Graded for export	Average grade	Grading port
Kaikoura	302	Kai	678	489	94.431	Lyttelton
Karamea	1,570	Karamea	406	302	94.206	Lyttelton
Inter-Wanganui	6	Inter-Wanganui	421	272	94.189	Lyttelton
Murchison	1,888	Airship	503	344	94.131	Lyttelton
Golden Bay	146	Sovereign	1,031	922	94.120	Lyttelton
Collingwood	1,254	Golden Hills	553	534	93.903	Lyttelton
Westland	145	Westland	718	582	93.813	Lyttelton

Cheese

Factory	Registered number	Brand	Production	Graded for export	Average grade	Grading port
Alton	1,890	Alton	891	889	93.045	Patea
Oxford	15	Oxford	599	596	92.860	New Plymouth
Woodlands	1,485	Woodlands	164	163	92.798	Bluff
Bidwill	270	Bidwill	285	264	92.727	Wellington
Oaonui	491	Oaonui	704	702	92.723	New Plymouth
Greytown	529	Greytown	989	929	92.711	Wellington
Massey	16	Massey	41	23	92.627	Wellington
Westmere	1,621	Westmere	531	531	92.599	Wellington
Bell Block	488	Bell Block	1,002	676	92.589	New Plymouth
Parkvale	1,240	Parkvale	607	593	92.585	Wellington
North Tiraumea	1,599	North Tiraumea	129	70	92.560	Wellington
Dalefield	9	Dalefield	1,126	1,107	92.557	Wellington
Joll (Tempsky Rd)	1,862	Maori Chief	630	610	92.516	Patea
N.Z. Dairy (Te Kowhai)	156	Anchor	1,174	1,156	92.514	Auckland
Mells	764	Mells	678	671	92.507	Patea

The Home Orchard in Winter

WORK in the home orchard does not need to be done to such an exacting timetable during winter as in summer, but it is just as important. In this article S. P. Money, Instructor in Horticulture, Department of Agriculture, Wellington, discusses berry fruits for the home garden and their requirements, the planting of trees, pruning, and winter spraying.

BERRY FRUITS

ALL of the berry fruit varieties have similar general growing requirements. Good drainage is essential; with bad drainage comes a multitude of troubles.

Root rots are the most serious of these and the most difficult to eradicate once they have been introduced. They often persist even when drainage has been improved. Drainage must be provided before planting if the soil is not naturally free draining.

This can be done for small areas in several ways. One is to dig over the whole plot to be planted and throw the soil back from the open trenches as digging progresses so that it will be higher than the surrounding area, leaving shallow trenches round the plot so that excess water will drain off. The shallow drains must be kept clear at the ends, however, or their purpose will be defeated.

Another method of providing surface drainage is to dig large amounts of organic material like wheat straw or sawdust into the beds. As much as 12 lb (dry weight) per square yard can be dug in. When this is done extra nitrogenous fertiliser such as blood and bone or dried blood should be applied to overcome the temporary lack of nitrogen which results when large amounts of fibrous material are added.

Field tiles or rubble drains composed of broken pieces of tiles, broken bricks, stones, etc., can be placed beneath the beds and covered with manuka brush to keep the soil from clogging them. In this method of draining also openings must have adequate run-off to be fully effective. If this last method is used, special attention will have to be given to watering during the dry months.

Shelter

To produce good crops berry fruits, like all fruits, require adequate shelter. In the home orchard any shelter hedge at least 5 ft high is normally sufficient for berry fruits. The main problem, however, is to have such shelter high enough in a small area without the hedge roots competing with the berry fruit for food. A good site for berry fruit will be one where shelter is provided by walls, fences, or trellises but the plants are not shaded.

If shelter in the form of a hedge is needed, care should be taken to choose a species that will not grow too profusely or too high ultimately. Suitable hedge plants that are also ornamental include *Abelia floribunda*, *Euonymus* (golden), *Lonicera nitida*, and *Shawia paniculata* (golden akeake).

As the roots of all hedges will to some extent reach into the fertilised area alongside berry fruit plantings, it is advisable every two or three years to dig a trench between the hedge and cropping plants to cut the hedge roots.

Too much shelter round a very small area encourages many fungous and bacterial diseases. The aim should be to provide sufficient shelter, but to allow the fruiting plants adequate sunlight.

Weed Control

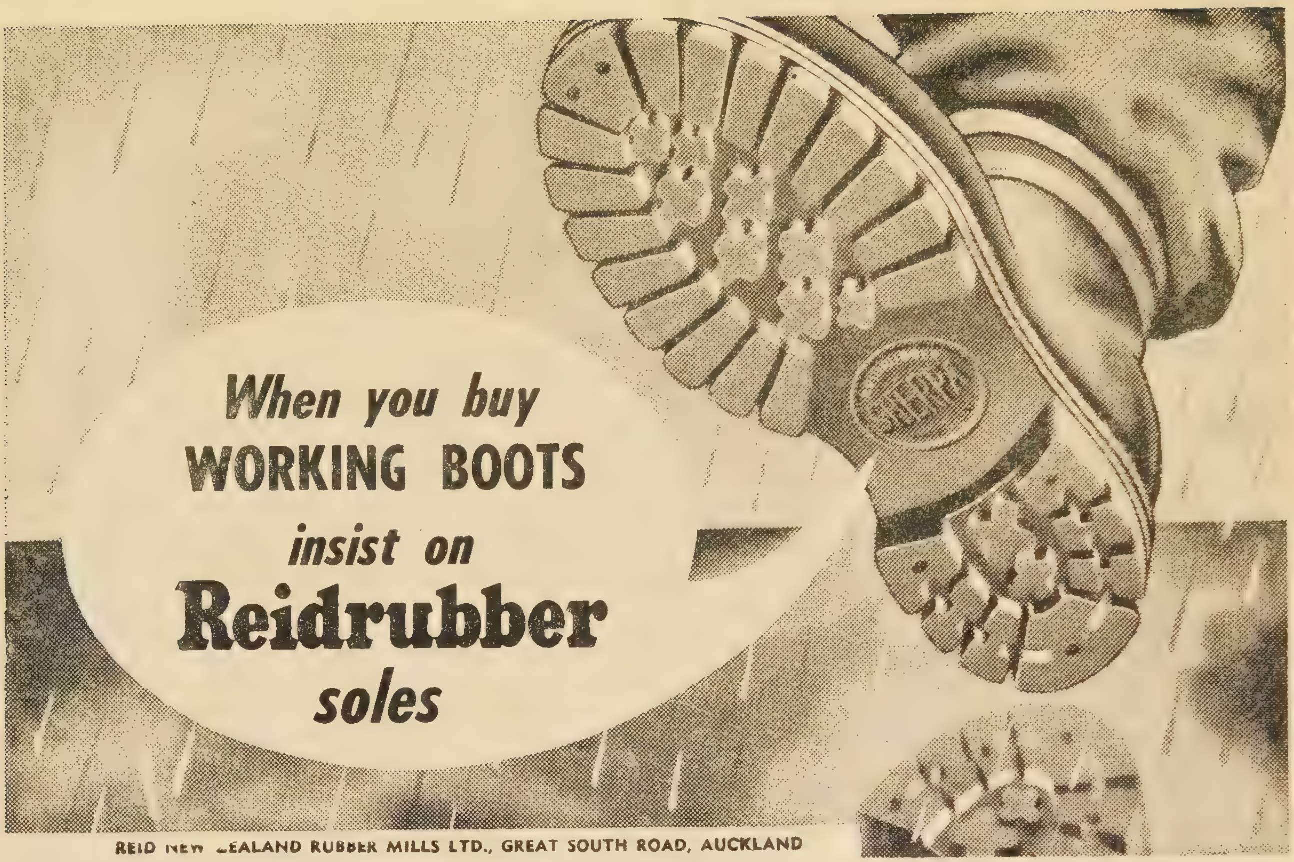
Before planting, persistent weeds such as couch grass (twitch), sorrel, docks, or clover should be eradicated. Thorough cultivation of the ground throughout a dry summer should destroy most of the weeds.

Before any berry fruit is planted a balanced fertiliser mixture should be worked into the bed. This should be made up of nitrogen (to promote growth), phosphate (for root development), and potash (for general hardening of the plant and to assist other processes). The amount of fertiliser will vary for different soil, but generally the following mixture can be used:

	Parts by weight
Blood and bone	6
Superphosphate	3
Sulphate of potash	1

The mixture can be spread on top and lightly hoed in at 3 to 4 oz to the square yard three or four weeks before planting.

Where soil is not in good condition organic material such as compost or rotted straw or sawdust should be worked in before planting. On soils in good order the same materials can be applied after planting as a mulch. In this way the shallow roots of the berry fruit plants are protected from drying out and as the nutrients are slowly leached from the mulch they are readily available to the roots just below.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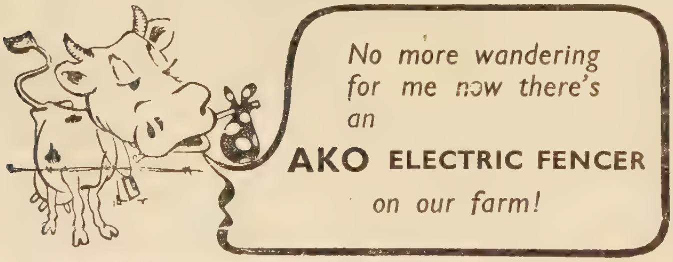

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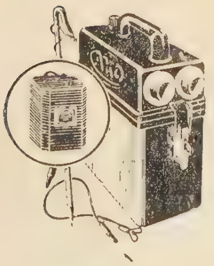
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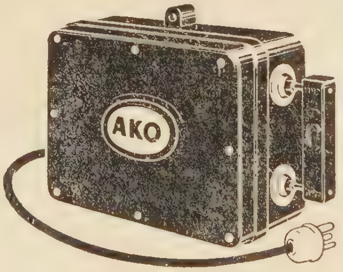
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Planting

When any kind of berry fruit is being planted care should be taken to spread out the roots. Often otherwise carefully prepared plantings are spoilt and results are poor because plants are set out with bunched and crowded roots. With the onset of spring both buds and roots begin to grow and if conditions are not good for the development of young root hairs, due to crowding, the plant is unable to take up sufficient moisture and many of the young shoots fail.

Strawberries

In the last 10 years several new strawberry varieties have been introduced by the Horticultural Research Station, Levin, and by nurserymen. At first the most important of these was Auchincruive Climax and it is still grown widely. When this variety developed a genetical disorder other varieties were introduced, including Talisman, Cambridge 407, Cambridge Rearguard, Merton Princess, and Redgauntlet. The most promising of these so far have been Cambridge Rearguard (an early cropping, large-fruited variety) and Talisman (for main-crop fruit).

Raspberries

Lloyd George and Marcy are the two most popular raspberry varieties for the home garden. Raspberries should not be expected to produce a crop in the first year. but care and encouragement of healthy canes will give a crop in the second year.

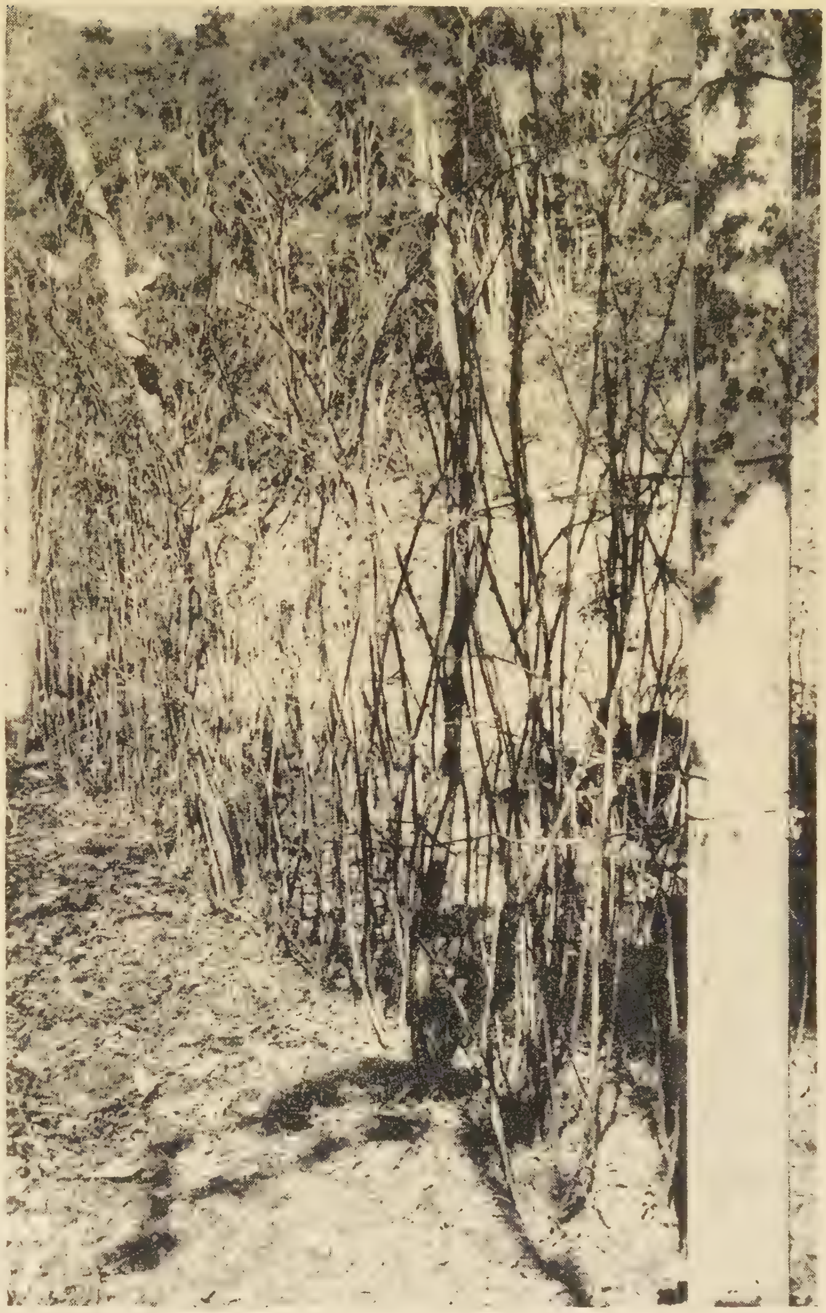
In the home orchard the hill system is probably the most convenient method of growing raspberries, as posts and wires for supporting the canes are not needed.

In the hill system some 6 to 8 canes are planted in a hill, a group of plants set over an area about 12 in. in diameter, each group being 6 ft apart each way. After planting, the canes should be cut back to about 6 to 9 in. In the second year, when the hills are fully established, canes are topped to a height of 4 ft to 4 ft 6 in., if growth is strong. In following years the new canes are tied loosely with binder twine and retained for cropping when the old ones are removed.

This system is particularly suitable for upright-growing varieties and these do not need supporting stakes. If the hill system is used for varieties which do not grow strongly or are somewhat spreading, a strong stake about 6 ft long should be driven into each hill before planting is done. Canes can then be tied to this.

Black, Red, and White Currants

Currants will stand more shade than other types of berry fruit, though they do best and develop better-quality fruit when grown in full sun. They can be planted in areas where there is too much shade for strawberries.



Raspberries planted in hedge system and wired after pruning and mulching. Old canes that fruited in the previous season have all been removed.

Currant bushes should be spaced 4 ft by 6 ft in the home orchard, though 6 ft by 6 ft may be better where growth is very vigorous. To grow the desired quantity as soon as possible it would be worth while to plant at half the ultimate row spacing and to remove alternate bushes as the rows become too crowded—after about three to five years.

Black Currants

Popular varieties of black currants include Goliath, Cotswold Cross, Lee's Prolific, and Boskoop Giant.

Red Currants

Red currants have lost some of their former popularity, but recently there

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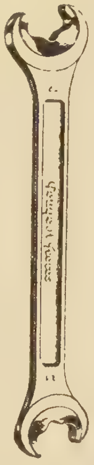

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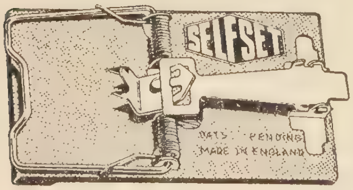

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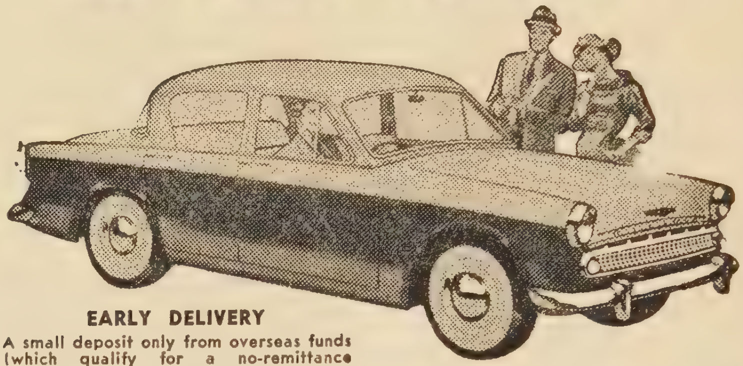

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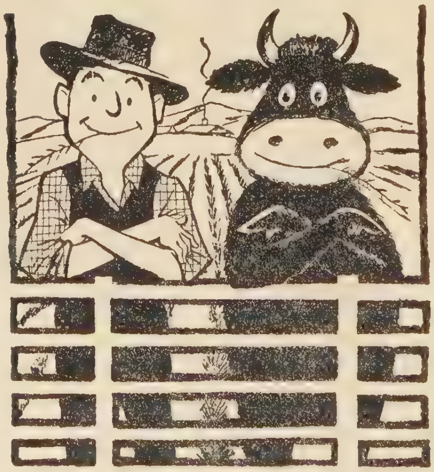

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has been renewed interest among home gardeners.

Fays Prolific is the variety most commonly grown in New Zealand. It is a heavy bearer and has reasonably strong growth.

White Currants

These currants are not well known in this country, but are widely grown in the United Kingdom for dessert. White Grape is a mild variety. Bushes have a rather spreading habit.

All the varieties of currants mentioned should be available from nurserymen or can be easily grown from hardwood cuttings taken now.

Gooseberries

The variety of gooseberry most grown today is Farmers Glory. The

PLANTING A FRUIT TREE

1—Roots of new tree covered with damp sack during preparation for planting to prevent sun and wind drying them out. 2—Tree in position with roots spread out over shallow, basin-shaped hole. 3—Good, fine soil being filled in over spread-out roots. This soil is firmed to hold the tree upright and filling in is then completed with the remaining soil.

Horticultural Research Station, Levin, has recently released the variety Levin Early, which has a similar spreading, weeping habit to Farmers Glory, but matures a week earlier.

Propagation

Cuttings can be taken in winter for propagation. One-year-old wood should be used and all the buds except the top three or four should be removed. The cuttings should then be placed in a propagation bed until they are rooted. Root development will be best in moist, sandy loams; heavy soils may be greatly improved by the addition of sharp river sand, because cuttings will not root unless the soil is fairly well aerated.

Place the cuttings in a trench about 8 in. deep and firm the soil round them to prevent them from being loosened by wind. Plants are usually ready for planting out in permanent positions in about two years.

ROUTINE WORK

Planting Trees

Planting of new varieties of bush and tree fruits ordered during autumn can be begun now or when the soil is in suitable condition. Before planting make sure that damaged or bruised roots are cut off. A sealing compound such as heavy petroleum jelly, which can be obtained from most seed shops, should be applied to the cut ends.

The area where trees are to be set out must have good drainage. The ground should be dug thoroughly at least a month before the trees are to be planted. Trees should be set into shallow, basin-shaped holes prepared just before the trees are planted. Roots should be spread evenly round the holes.

Take particular note of the parts of the tree at this time. It is composed of two main sections: The lower part of the trunk is the stock, from which the roots grow; the upper part extending into branches has grown from a bud of a particular variety inserted in the stock at the nursery. A stock is used to give strong, disease-resistant roots; therefore the variety wood, or scion, must be kept clear of the soil. When planting it is important to keep the place on the trunk where these two types of wood meet—known as the bud union—6 to 8 in. above ground level.

Dwarf fruit trees need supporting stakes. These should be provided at planting, as the roots are very brittle and likely to be damaged if the tree is rocked by wind.

With any fruit tree there is a direct relationship between the size of its root system and the number of branches it can carry. If trees received from a nursery have small root systems, their tops should be pruned hard before planting to reduce the number of leaves the small root systems will have to support. They should be staked firmly to prevent damage to the developing root system during establishment.

Pruning

For the first year or two pruning to develop a strong framework for the young trees must be the aim. This applies to both dwarf and standard trees. Dwarf trees will set fruit more quickly than will standards, but even dwarfs should not be encouraged to fruit heavily too early.

During the pruning season Department of Agriculture officers give pruning demonstrations and lectures at gatherings arranged by horticultural and other societies. Home orchardists wishing to improve their pruning methods should get in touch with the Department's office in their district for information about the time and place of these gatherings.

Winter Spraying

Winter spraying in the home orchard is designed to destroy the overwintering spores of diseases and eggs of pests. Sprays properly applied at this time in conjunction with efficient orchard hygiene can do a great deal to ensure good crops in the following season.

Lime sulphur and winter (red) oil are the two main materials used as sprays on fruit trees when they are dormant in winter. Usually only winter oil is applied, but when scale infestation is particularly bad or there is a heavy attack of San Jose scale, lime sulphur is applied first. This loosens the scales and allows red oil applied several days later to penetrate and kill the scales. During the dormant season red oil is applied at 1 part to 17 parts of water and lime sulphur at 1 part to 15 parts of water.

Using Testing Figures for Culling Poor Producing Cows

HERD quality can be improved only by culling the poorer producers and replacing them with better cattle. If sufficient poor cows can be identified and replaced by superior cattle, quite rapid progress can be made in improving the quality of a herd. The selection of animals to be culled is therefore of considerable importance.

WHEN animals are selected for culling an estimate is really being made of each cow's future production in relation to that of other cows in the herd. This is done by comparing their past performance and then considering any factors which might help or hinder future production.

Herd testing figures provide an estimate of past performance. However, it is obvious that the lowest producers as shown in the test returns are not necessarily the poorest in a herd. A young cow which aborted, contracted foot rot, or went down with acidosis or a later calver would probably have produced more under normal circumstances than another cow of similar output which had better opportunities for doing well. Some allowance should be made for every factor which has hindered production but which is not likely to recur. Further, in any group of cows of similar production the smaller animals are preferable because their yearly intake of food is less than that of larger animals.

When future production is being estimated particular attention should be paid to disease, age, and date of calving. An empty cow will not produce as much as when she calves normally and usually only very good cows are worth carrying over. A heifer or second calver can be expected to improve in the future, and mature cows will normally decline slowly in production. A late calver will similarly be a poorer bet than when calving at an opportune time and may well be difficult to bring in early in the future.

After allowance has been made for all these associated factors cows which appear to have the worst performance records and least chance of ever doing wel lshould be culled first. Unfortunately, in some herds a proportion of good cows produce poorly because they are improperly milked. However, unless the milking fault is detected and remedied, these cows are never likely to produce well and are best culled.

—*J. D. J. SCOTT,*
Instructor in Agriculture, Department of Agriculture Ruakura Animal Research Station, Hamilton

External Parasites of Poultry

By the ANIMAL INDUSTRY DIVISION,
Department of Agriculture, Wellington

THOUGH external parasites common to poultry are not necessarily a serious menace to birds, their presence in large numbers can undoubtedly result in a drain on their constitutions and they should be kept under control by all poultry producers.

DAMAGE BY LICE AND MITES

A NUMBER of species of lice and mites can be troublesome to poultry, but only those common among birds in New Zealand will be described. A marked difference between lice and mites commonly found in this country is that the lice bite while the mites penetrate the skin and suck blood from the bird. When in large numbers both lice and mites can cause severe irritation, and mites can cause an undesirable loss of blood. Quite serious damage can be done to young stock, as when heavily infested they cease to thrive. Young, growing cockerels can be surprisingly poor in condition and even stunted in growth when heavily infested with mites at night. Similarly the condition of laying stock can deteriorate and egg production fall if birds are seriously attacked by external parasites.

Unless a constant watch is kept for both lice and mites, particularly during hot weather, their numbers may increase to a point where serious damage is done. As with internal parasites this damage may be done before the poultry producer realises that lice or mites are the cause.

LICE

Lice are a common external parasite of poultry and are broadly classified according to the part of the bird on which they are found—head lice, body lice, and wing lice. If the feathers of an infested bird are parted, the lice may be seen moving rapidly over the skin. They are light brown. The first place to check is on the body around the vent, as they are most commonly found there. In addition to lice seen moving on the skin nits or lice eggs will be found firmly attached to the bases of the feathers, appearing as a greyish-white powdery mass.

Lice can multiply at a great rate, as the nits hatch out within about a week after being laid and the young lice reach maturity in about another two weeks. Therefore, any neglect to check their development can result in a bird being heavily infested within a comparatively short time. Lice are far more active and multiply more rapidly in summer weather, being of little trouble during winter.

When infested birds are handled it is common for the lice to stray on to the handler, but fortunately they live for only a short time when away from their natural host and are only a temporary nuisance to man.

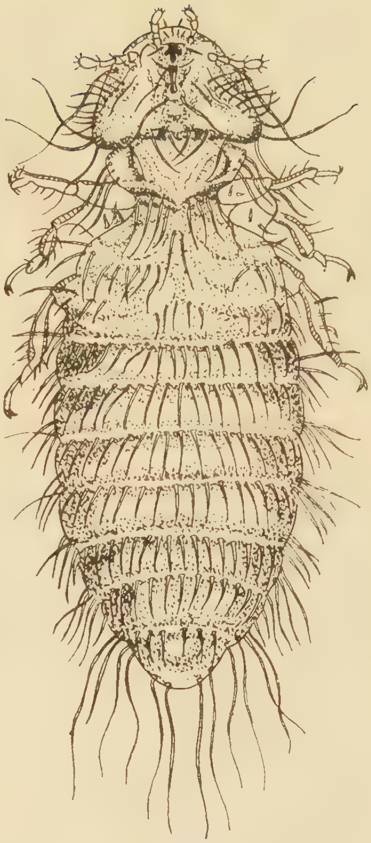
Controlling Lice

It is not difficult to destroy lice on poultry. Birds may be treated individually or as a flock, but generally producers wish to treat a flock and this is comparatively simple where birds roost at night on perches.

For many years 40 per cent solution of nicotine sulphate has proved effective in destroying lice. This solution is painted in a narrow strip along the perches shortly before birds go to roost, about a fluid ounce of the solution being used to every 20 ft of perch. This should be done on a calm evening, as in a windy or draughty house the fumes which kill the lice may be dispersed too rapidly. Fumes are released from the solution when the birds rest on the perches and these fumes permeate the feathers and kill the lice. The fumes do not destroy the nits, and consequently the treatment must be repeated after 10 days to destroy any lice which have hatched out meantime.

In recent years drugs which are effective in destroying external parasites of poultry have come into common use. Perch paints are now available. Those which contain benzene hexachloride (BHC) and DDT have an advantage over plain nicotine sulphate because they have a residual effect lasting for a considerable time after application to the perch. Thus young lice which hatch from nits after the original application of the paint are killed by this residual effect, making unnecessary a second application ten days after the first as is required when nicotine sulphate is used.

Nicotine sulphate and perch paints are effective against lice on the body and around the wings, but do not destroy those on the neck or head. Sometimes it is necessary to treat individual birds; for instance, stud cockerels before dispatch from the farm to a customer. In such cases dusting powders containing benzene hexachloride or lindane may be used. Sodium fluoride dust is also effective, but is less pleasant to use. These powders may be applied to the birds with a shaker, but this method is apt to be wasteful, more powder being used than is necessary. A pinch—the amount held by the first finger and thumb—of powder applied around the vent, under each wing, and around the neck will be sufficient to destroy lice.



[After Reis and Nobrega in "Diseases of Poultry", Collegiate Press, Iowa, U.S.A.

A male poultry body louse.

Lice on Birds in Cages

There seems to be controversy on whether lice in moderate numbers cause trouble to birds in laying cages. However, they can be easily destroyed in cages by using a knapsack sprayer to spray the birds from the underside of the cages with 0.5 per cent malathion. This solution is obtained by mixing 4 tablespoons of 50 per cent malathion concentrate in 1 gallon of water. This spray should not be allowed to come in contact with the heads of the birds.

MITES

The three species of mites which attack poultry in New Zealand are red

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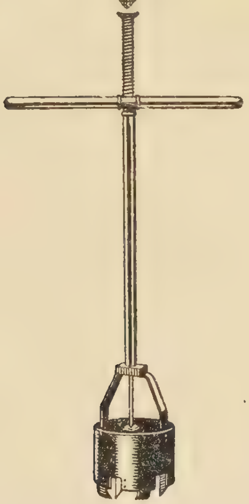

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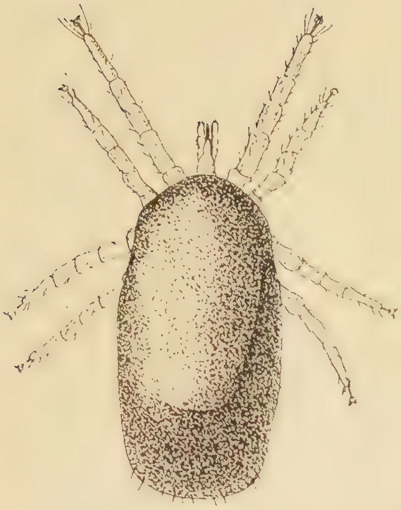


[*After U.S. Department of Agriculture Bulletin, reproduced in "Diseases of Poultry", Collegiate Press, Iowa, U.S.A.*

A female red mite, greatly engorged with blood after feeding.

mites, northern poultry mites, and the mites which cause scaly leg. They differ appreciably in habits and consequently must be considered separately.

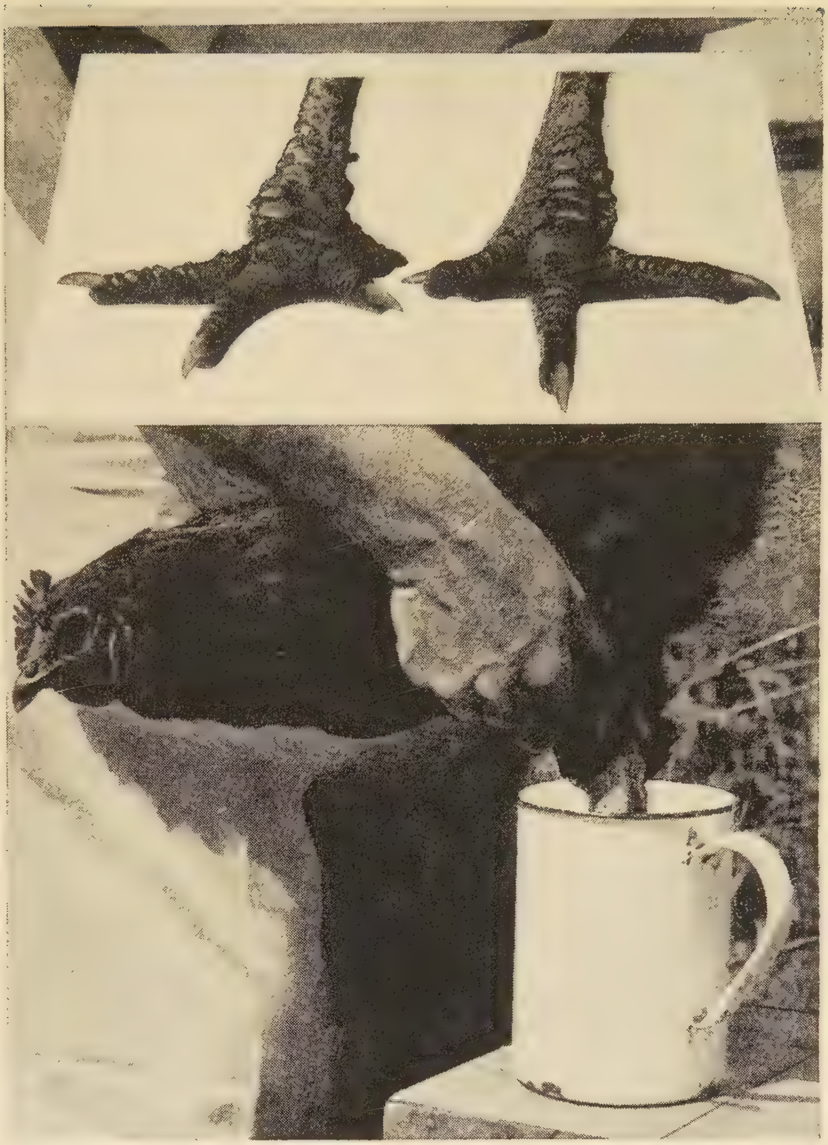
Red Mites

Red mites are the most common mite species on poultry. When starved they are dirty grey, but generally the poultry producer sees them after they have had a feed of blood, when they become reddish in appearance, hence the name "red mites".

These mites differ from lice in that it is rare to find them on birds unless the birds are examined at night. During the day they stay on the woodwork in the house, favourite places being under the perch ends where they rest on wooden bearers, or if the perch extends right up to the side of the house, on the ends of the perches. They will collect under old, dry droppings that have stuck to the top of a perch bearer or on top of nest boxes. Clusters of these mites will be found in crevices in timber or in knot holes.

Obviously, therefore, the poultry producer must watch the house and equipment during the daytime for these mites. Birds do not show any signs of this infestation until the numbers of mites are great enough to affect condition and even production.

If a poultry house is badly infested and the birds are removed from the house, within a day or so these mites will crawl all over the house, including the underside of the roof. As they are now starving, they appear as swarms of small, grey, crawling objects. Sometimes producers who have not seen them in this condition fail to recognise them as red mites and believe that the house has become infested with some other kind of parasite. Though they will crawl on to a person entering the house, they do not appear to attack man by sucking blood. Red mites can multiply rapidly in warm or hot weather. They rarely cause trouble in winter.



[*Niederer*

Method of dipping a bird's legs for treatment of scaly leg. Inset—Legs of a bird infested with scaly leg mites.

Control of Red Mites

As with other troubles prevention of red mites is better than cure. Much trouble from red mites can be avoided by doing away with the places in which they congregate. Thus perches may be placed on iron spikes set in the floor instead of on the commonly used wooden bearers. Gaps should be left between the ends of the perches and the walls of the house.

Creosote and kerosene painted on the perches or on woodwork crevices will not only kill the mites but will make the woodwork obnoxious to them. Spraying the perches and surrounding woodwork with either DDT suspension or benzene hexachloride water suspension will not only kill the mites, but the residual effects of the sprays will give added protection against the parasites. If preparations of 1.5 per cent DDT suspension in water or 0.5 per cent benzene hexachloride water suspension are sprayed over the perches, walls, and nest boxes, they will prevent red mite infestations. Malathion 0.5 per cent concentrate is also very effective against these parasites. To obtain this solution mix 4 tablespoons of 50 per cent malathion in 1 gallon of water.

Northern Poultry Mite

The northern poultry mite has only recently been identified in New Zealand, being found on birds in laying cages. It is about the same size as the red mite, but is darker, and differs also from the latter in that it lives and breeds on the birds and not off them as does the red mite. Unless the mites are present in very large numbers, they do not appear to disturb the birds. Eggs are laid at the bases of the feathers and around the vent. These mites are usually first detected when they appear on eggs laid by the birds in laying cages. If an attempt is made to wipe the mites off the eggs, sooty marks are made which later have to be washed off.

Control of Northern Poultry Mites

Northern poultry mites have been controlled successfully in New Zealand by spraying birds in cages with 0.5 per cent malathion. A knapsack sprayer is used and the birds are sprayed from underneath the cages. The birds must not be sprayed around the heads. Spraying cages with malathion is not only effective against northern poultry mites, but is also most effective against lice and red mites. The last named are found occasionally on laying cages, even when they are of all metal.

Scaly-leg Mites

Scaly-leg mites normally confine themselves to the legs of birds, where they burrow between the scales, causing them to lift and to give the legs a rough and enlarged appearance. On clean, well managed farms scaly legs are rarely seen on birds. Sometimes older birds contract the trouble, and in severe cases birds will go lame.

Control of Scaly-leg Mites

The condition is spread by contact and consequently the first step is to remove from the flock any birds suffering from scaly leg. The legs of an affected bird should be scrubbed with hot water and soap, after which the feet and legs should be dipped in a mixture of 1 part of kerosene and 2 parts of linseed oil. Care must be taken to stop the mixture from touching the fleshy parts of the legs, as kerosene will burn the flesh.

FLEAS

Occasionally nest boxes and litter in poultry houses become infested with poultry fleas, which breed in dirty nest boxes or in litter. They do not live on poultry, but only remain on the birds to feed. Hay in nest boxes appears to harbour fleas more readily than does straw. These external parasites can be most unpleasant to human beings when eggs are being collected, but more particularly when the litter is being cleared from an infested house. As the birds have been removed from the house, the fleas become hungry and are all too ready to attack those cleaning out the house.

Fleas may be destroyed by adding 10 per cent DDT powder or 0.5 per cent benzene hexachloride to the litter in nest boxes or on the floor.

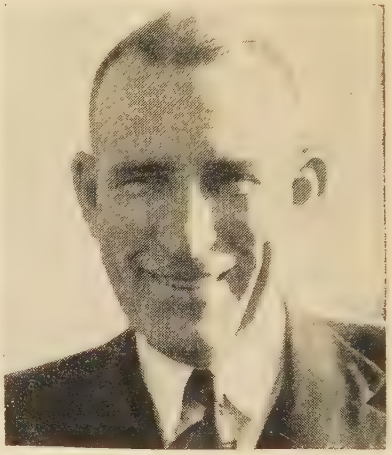
Meteorological Records for March

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	240	65.4	+ 1.6	81.1	48.2	8.89	10	+ 4.71	2.24	14	148
Auckland	160	66.6	+ 1.7	77.7	50.4	4.15	13	+ 1.00	1.67	5	189
Tauranga	12	63.9	+ 1.3	77.0	47.0	6.27	15	+ 2.17	1.11	14	170
Ruakura	131	62.4	+ 1.2	77.4	36.6	2.71	14	— 0.27	0.65	5	150
Whakarewarewa ..	1,006	61.1	+ 1.4	76.3	42.0	5.21	12	+ 1.16	1.34	17	146
Gisborne	12	62.8	+ 0.8	82.0	37.5	5.30	14	+ 1.61	2.75	30	160
New Plymouth ..	160	63.8	+ 2.8	77.8	46.5	6.81	9	+ 3.07	2.33	29	187
Karioi	2,125	57.2	+ 2.1	73.9	33.2	2.30	10	— 0.04	0.97	29	
Napier	5	63.2	+ 0.8	84.1	45.5	2.68	15	+ 0.10	0.80	29	188
Wanganui	72	63.0	+ 1.4	81.8	42.3	2.79	12	+ 0.64	1.06	11	183
Palmerston North ..	110	62.0	+ 1.7	78.3	40.2	3.59	14	+ 1.36	1.14	18	162
Waingawa	340	60.2	+ 1.2	79.5	36.0	2.16	15	— 0.04	0.60	12	147
Wellington	415	60.7	+ 1.3	75.6	43.2	2.70	11	— 0.48	0.92	11	185
Nelson airfield ..	5	61.2	+ 2.8	79.9	43.2	5.51	14	+ 2.82	2.04	17	202
Blenheim	12	62.4	+ 2.5	82.0	41.8	1.91	7	+ 0.38	1.40	17	200
Hokitika South ..	15	59.0	+ 2.7	75.2	41.0	9.32	16	+ 0.38	2.13	17	
Hanmer	1,270	56.2	+ 0.0	79.0	34.0	6.33	13	+ 2.97	2.77	12	145
Christchurch ..	22	59.2	+ 1.1	90.4	39.3	2.35	8	+ 0.41	0.97	12	154
Ashburton	323	58.4	+ 0.6	87.8	32.0	6.11	13	+ 3.91	3.12	12	146
Timaru	56	57.9	+ 0.5	91.6	37.2	2.98	15	+ 0.85	0.87	17	153
Alexandra	520	58.4	+ 0.8	83.7	32.6	0.26	4	— 0.89	0.10	9	197
Taieri	80	55.8	+ 0.6	89.1	31.8	1.34	12	— 0.73	0.26	11	177
Invercargill airfield ..	0	53.6	— 0.2	77.9	27.6	1.44	16	— 2.59	0.30	9	169
Chatham Islands ..	150	57.5	+ 1.1	69.0	43.5	1.02	10	— 1.54	0.33	18	

Mr A. G. Elliott Retires

MR A. G. ELLIOTT, Fields Superintendent, Department of Agriculture, Dunedin, has retired after 42 years' service with the Department. Joining the Department in 1917, Mr Elliott served as an Instructor in Agriculture at Auckland, Invercargill, Christchurch, Blenheim, and New Plymouth before becoming Field Crop Experimentalist at Wellington in 1939. He was appointed Fields Superintendent at Dunedin in 1945.

As Field Crop Experimentalist during the war Mr Elliott organised many experiments with serpentine superphosphate and showed that it could be useful under New Zealand conditions. This resulted in a great saving of rock phosphate, supplies of which were almost cut off by the Japanese occupation of Nauru and Ocean Island.



Mr A. G. Elliott.

He organised experimental work on linen flax, a crop which the British Government requested the New Zealand Government to grow as part of the war effort and about which little was known under New Zealand conditions. He was also associated with several committees set up for the distribution of seeds and fertilisers.

As Fields Superintendent at Dunedin, Mr Elliott was actively associated with the Otago Catchment Board and land development in Otago and Southland, and he did much to develop second- and third-class land by the use of modern techniques. Some of the first experiments on molybdenum deficiency in certain Otago and Southland soils were laid down under his control. He was a member of the Field Crop Committee and under his guidance a programme of crop improvement was carried out.

Mr Elliott was always interested in Young Farmers' Clubs; he was responsible for forming the first six clubs in Taranaki, and the movement in Otago and Southland owes much to his enthusiastic support.

Asparagus Growing in Hawke's Bay

| Orr

THOUGH a fairly expensive crop to establish, asparagus because of its long productive life soon repays a little extra time, care, and expenditure in soil preparation, planting, and maintenance of the area where it is grown. Methods used in Hawke's Bay to ensure satisfactory establishment and maintenance of asparagus areas and the harvesting and processing of the vegetable are described in this article by A. I. Moffitt, formerly Horticultural Instructor, Department of Agriculture, Hastings.

THE genus asparagus is a member of the lily family (*Liliaceae*) and has at least 150 species native of Europe, Asia, and Africa. Common edible asparagus, *A. officinalis* var. *altilis*, is a herbaceous perennial developed from the wild species of Europe and Asia.

Though it has been in Hawke's Bay for more than 40 years, extensive planting for canning purposes was begun only in 1937. The area in asparagus has continued to increase steadily in the last 20 years and at present over 600 acres are in production.

Type of Soil

As long as the topsoil is reasonably deep, asparagus will thrive on quite a wide range of soils. Shallow soils with hard subsoils are unsuitable. In Hawke's Bay highest production is obtained on deep, free, silt loams of the Hastings and Twyford series, with a pH of 6 to 6.8. On a light, sandy soil production may not be heavy and the harvesting season is shorter, but it is usually earlier, thus commanding better prices if the crop is grown for the open market. However, early maturity offers no advantage where the crop is grown for canning or quick freezing.

Preparation of the Land

The best possible soil conditions should be obtained before planting, as asparagus plants will produce profitably for 25 years or more. Under ideal conditions and good management where perennial weeds have never competed with the crop paying crops are produced for nearly twice this period.

As it is such a long-term crop, the incorporation of organic matter is most important. Cover crops with ample fibre content can be grown the season before planting to supply this material. Land that has been under pasture provides a good supply of humus, but even then a bulky crop such as blue lupin or one of the cereals could be grown with advantage after the sod has been worked up. Organic matter in the form of cover crops is difficult to supply once the asparagus block is established, though certain cover crops can be sown between the rows when cutting ceases for the season.

> ASPARAGUS is an important crop on the fertile silt loams of the alluvial flats near Hastings, Hawke's Bay. Almost 900 acres have been planted, with a proportion of this area still to reach full production. Practically the whole of this vegetable crop has until now been consumed in the fresh or processed form within New Zealand. But the demand for canned green asparagus is very heavy in overseas markets and the produce from a greatly increased acreage could be disposed of with little difficulty.

Fern growth should never be cut and carried off or burnt, but should always be disced in when it has turned yellow. When the fern starts to dry off and change colour from its normal green to a yellow tinge it is a sign that it has completed its function of building up the storage of food in the root system ready for the next season's growth.

Removing or burning the fern growth destroys much useful organic matter which in time would provide humus for the soil. Seedlings that develop from fallen berries can be controlled by proper cultivation.

Soil should be free draining, but asparagus will tolerate a reasonable amount of water if it does not lie for too long. In some areas production is higher in low-lying patches where water lies for short periods after heavy rains than in surrounding parts, but that is most likely the result of a more plentiful supply of moisture during spring and summer rather than of poor drainage and waterlogged conditions.

In dry summers some form of irrigation such as rotary sprinklers would ensure adequate fern growth where this is flagging and so build up the crowns for the new season.

It is most important that land should be free of perennial weeds

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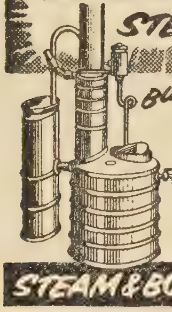

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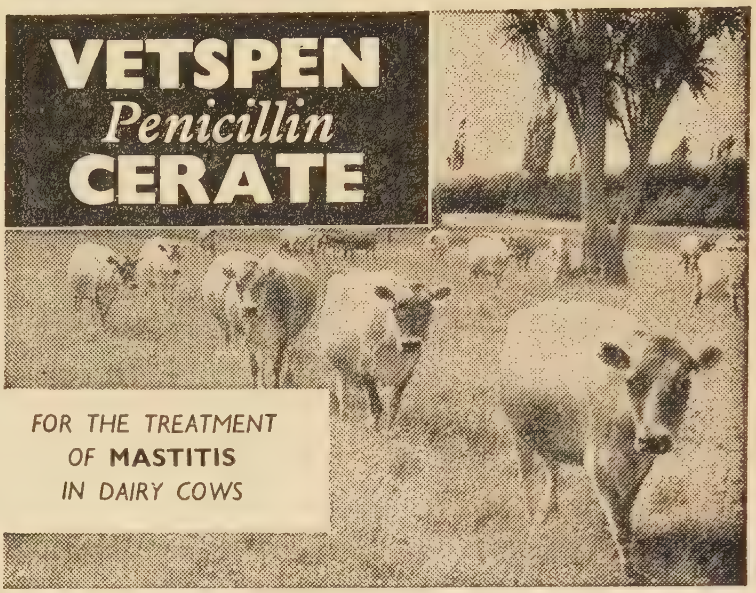

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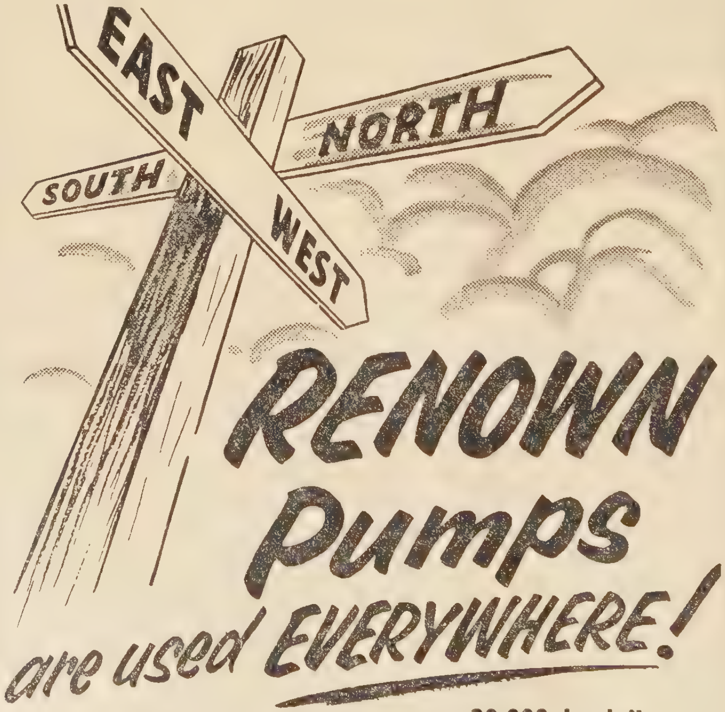

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initially, as control is extremely difficult when the crop is in the ground. Pre-planting cultivation should therefore be directed at cleaning the land and the preparation of a 14 in. depth of loose, friable soil.

Planting the Crowns

One-year-old crowns are definitely recommended for commercial plantings. Those left in the nursery bed for 2 years are often poorly developed through having been too crowded; roots become intertwined and hard to separate, digging is much slower and more difficult, and more damage is done to roots in lifting them. Asparagus roots are very thick and fleshy and are quite easily damaged. Nothing is gained by planting 2-year-old crowns and the cost of the plants is much greater.

In the North Island asparagus is usually planted in August, but later planting is quite satisfactory as long as the crowns have not broken into growth. Soil conditions should govern the time of planting to a great extent, and planting while the soil is very wet is not advisable.

Depth of planting will have to be varied to some extent according to the type and depth of soil. In the deep, loose, loam soils of Hawke's Bay 8 to 10 in. is recommended. In a light, sandy loam a little deeper would be advisable if the soil tends to dry out badly in summer. But in heavy or very shallow soils 8 in. may be so deep that yields are reduced and a shallow depth may have to be adopted; moulding up over the row would then be necessary to prevent damage to the crown in cultivation.

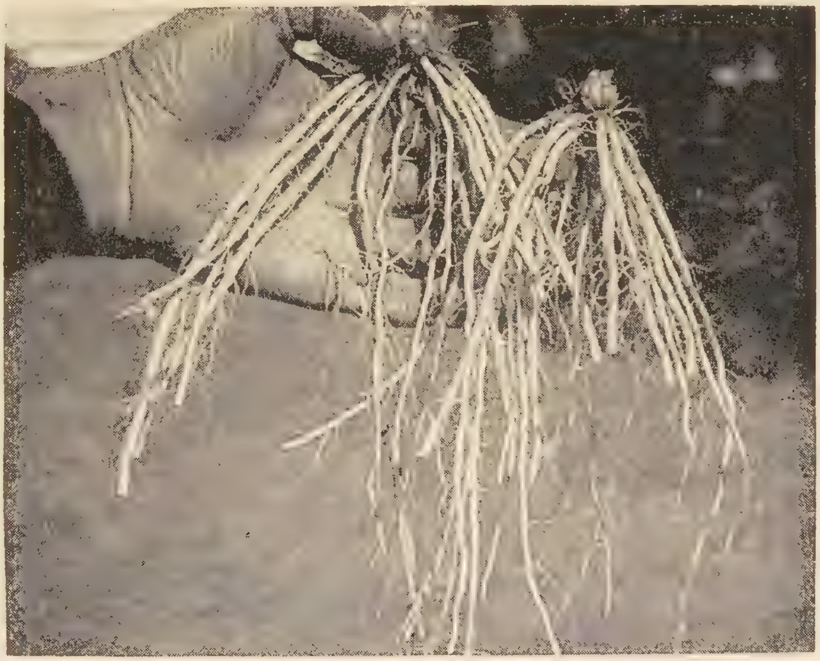
The crown must be planted in soil that is rich in plant foods. Therefore placing it in a lifeless subsoil just to get the crown out of the way of cultivation is useless, so planting depths must be varied accordingly. However, the natural tendency is for crowns to extend their growth toward the surface over some years and this must also be taken into account when planting depth is decided.

Asparagus has a naturally extensive root range, but to produce a crop in the early life of the plantation it is advisable to plant as closely together as is also conducive to heavy cropping in later years. The spacing varies according to soil type, but 7 ft x 1½ ft (4,150 plants per acre) is becoming generally favoured, as this row width facilitates cultivations and the spacing in the row produces what is thought to be the best population per acre. There is, however, no experimental evidence on this point.

The furrow in which the crowns are placed should be made 2 to 3 in. deeper than the level at which the crowns will be when they have been planted. The roots then have loose

Orr

Planting 1-year-old asparagus crowns. They are set 18 in. apart in rows 6 ft apart. Furrows are gradually filled in so that crowns are ultimately 8 to 10 in. deep.



A desirable type of crown produced 10 months from sowing. The buds are strong and healthy and the root system is well developed.

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soil under them for quicker root establishment, though the main root growth is outward from the crown. A deeper furrow also allows some topsoil to fall or be pulled into the bottom and the crown should be set on this. It also allows more depth in places where the furrow may vary.

[Orr

Rows of asparagus seedlings sown 1 ft apart and kept weed free with a wheel hoe. Seedlings are best thinned to 4 in. to produce strong yearling crowns.

Striking out the furrows too far ahead of planting is not advisable. Planting should be done immediately while the soil is moist and easily worked. Soil that becomes lumpy through exposure will not settle well round the roots and is the cause of many plants failing to become established.

Sometimes—for instance, if a contractor has to be hired—it may not be possible to plant while the soil is still moist. If the soil is dried out by wind or exposure and becomes difficult to handle, a shovelful of moist soil should be placed over each crown and around the roots to ensure that the plant does not become dried out. Usually a hoe or trowel should be used to pull the necessary amount of soil from the side of the trench over the plant, and this should be well firmed by treading on either side of the plant.

Covering by hand is preferred to mechanical coverage, because it allows individual attention to be given each plant. If the plants are covered by discs or some other implement, a very close inspection should be made afterward to ensure that no plants are exposed. However, the depth to which they have been covered cannot be observed, and if the furrows are uneven, some plants may be smothered.

The crowns are best covered to a depth of 2 in. or a little more at planting time. If covered too deeply at first, they tend to be smothered. It is not natural for plants to thrive at a great depth, and the main reason for such deep planting is to avoid the crowns being damaged during cutting and cultivating, but they will tend to grow toward the surface with time. Small crowns tend to be smothered more easily and weak ones should be rigorously discarded as they are noticed.

Everything possible should be done to ensure a perfect strike in the first year, as gaps mean a reduction in yield and are very difficult to fill in the second year. Therefore a little added care and expense at first planting are well repaid.

A first-year asparagus block with furrows filled in and an intercrop of potatoes. It was photographed in December.

Replacements

If a few plants fail to grow even after all reasonable care has been taken, they can sometimes be replaced successfully in November or early December. Replacement should not be attempted too soon, however, as some crowns may take much longer than others to start into growth. On a larger scale crowns can be lifted when dormant and held in boxes in cool store at a temperature of approximately 35 degrees F. Soil conditions must be reasonably satisfactory for the replacements to be successful, but even if they do not all grow, misses are at least reduced and the subsequent production level raised.

Establishment Costs

Establishment costs are about £40 per acre for the first year. By the fourth year the minimum gross return is about £150 per acre.

Subsequent Cultivation

The trench in which the crowns are planted is filled in an inch or two at a time after the fern has grown to a height of 6 or 8 in. This operation is carried out with a tractor and spring-

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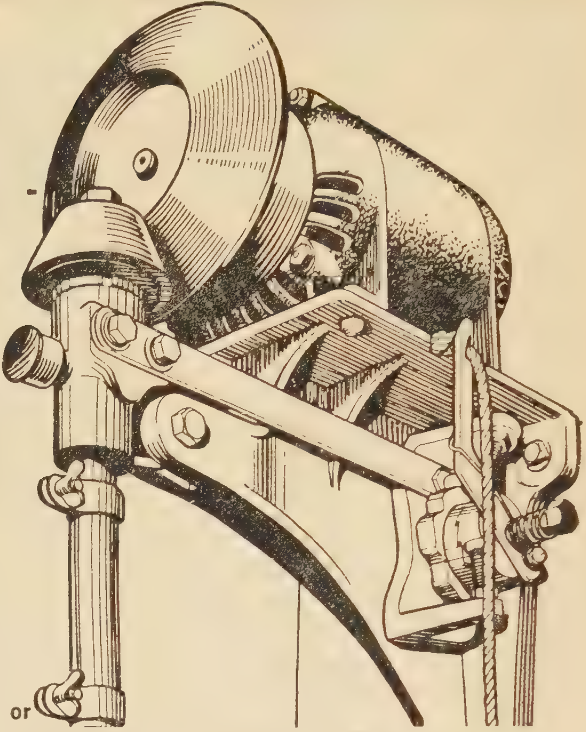

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tine cultivator on large areas and on small areas often with a small rotary hoe set at shallow depth. With this method annual weed seedlings are smothered enough to keep them in check. If the area is particularly weedy, hand hoeing may also be necessary. By early summer or midsummer the furrows should be filled and the whole area reasonably level. When the fern turns yellow in late autumn, including the lines of the crowns, the whole area can be disced and left rough for winter.

In late winter or early spring the new season's cultivation is begun. At this stage two or three discings may be given, but the discs have only a light "set" so that cultivation is shallow but sufficient to move and break up the soil. A little later, some time in August, a light moulding is thrown up over the lines of the crowns with a special set of discs or moulders which throw the soil up over one row at a time. Apart from added protection to the crowns, and other beneficial effects, this light moulding smothers small weed seedlings growing along the lines of the rows.

At this stage—that is, the last cultivation before spear emergence—growers with smaller areas have in the past few seasons successfully applied pre-emergence weedkillers such as CMU to the row lines. Rates used are 3 to 4 lb per acre. On the larger areas in Hawke's Bay light mechanical cultivation is still the main method of weed control during the cutting season.

Several types of cultivators are used, including tractor-mounted spring tines, and on some soils rotary pea weeders are proving most successful. This type of cultivation is fast and large areas can be covered by one man and the unit in a day. Cutting is retarded temporarily, but surprisingly few spears are damaged and good kills of weed seedlings are obtained.

Intercropping Young Blocks

Intercropping is not recommended, but few growers can afford to let the land lie idle until the crowns begin to bear in the third season from planting. With careful choice of crops, more care in cultivation, and allowance for the extra crop in fertilising, intercropping can be done without too much detriment to the asparagus.

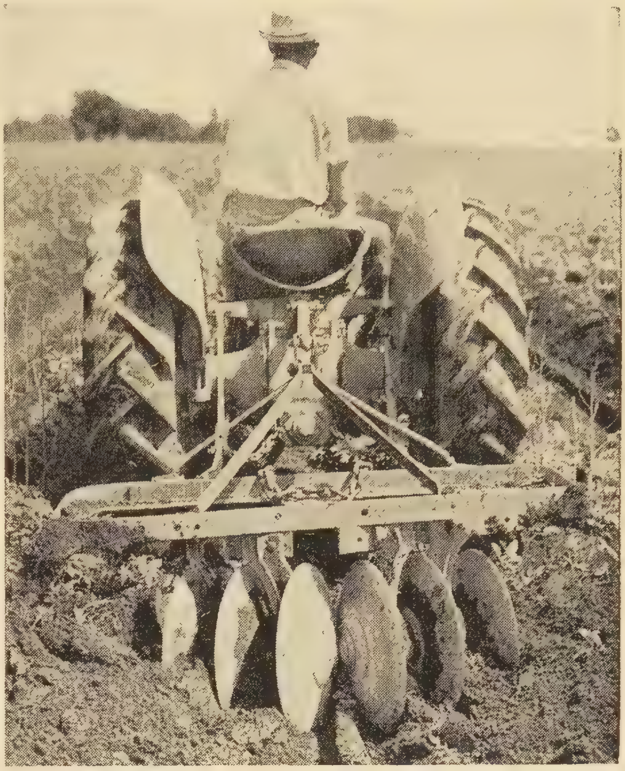
Intercropping interferes with the filling in of the furrows (unless a late catch crop can be grown in December) and makes more hand work necessary in the first season. Fern growth is quite considerable in the second season, making the choice of crops difficult. If potatoes are grown, the variety should be one which does not produce over-vigorous top growth. Dwarf tomatoes have often been used.

Other possible crops for smaller areas are lettuce, dwarf beans, and early cabbage. Irrigation may have to be considered for both the asparagus and the catch crops in dry seasons.

Weed Control

If the soil is suitable and planting has been done thoroughly, weed control is the grower's main concern on asparagus areas in Hawke's Bay. From the time the seedbed is formed weeds must not be allowed to develop to any great extent. The only time they can be tolerated is late in the season on mature beds when harvesting has been completed and even then it is unwise to let them seed if it can be prevented.

When the crowns have been planted in the furrows, filling in helps to control annual weeds. In the second year it is more difficult, as the land is then level. Either earth must be thrown up to smother the weeds or much hand work done. And earthing up is limited, because the crown should not be covered too deeply in the second year. A last shallow cultivation is usually made as late as possible before spear emergence.



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A tractor with a special set of discs to throw a shallow mould over each row to smother weed growth. These discs can be adjusted to turn the mould back into the row centres when necessary.

Chemical weedkillers have made weed control during the establishment period much easier. One of the best of these appears to be CMU, a urea compound, applied at 2 to 3 lb per acre on seedling beds.

One of the worst annual weeds in asparagus areas in Hawke's Bay is *Amaranthus retroflexus*, commonly called Prince of Wales feather. It is very susceptible to CMU, and both trials and field practice have shown that one application of this chemical at 4 lb per acre will give excellent weed control during the greater part of the cutting season on established beds. There is no damage to the spears under normal weather and soil conditions.

Thistles and docks can be controlled with hormone weedkillers applied at the end of the cutting season just before fern growth is allowed to develop. Twitch (*Agropyron repens*) can very largely be controlled in asparagus areas by the use of sodium trichloroacetic acid (TCA) at rates of from 80 to 100 lb per acre without any harmful effect on the spears. This heavy rate is necessary for a good kill, as it is practicable to apply the chemical only in winter, when the fern has been disced under. Soil conditions are not the most suitable for best results with TCA at this time, however, and better kills at lower rates would be obtained if it could be applied in autumn.

Dalapon, a cheaper material which is more selective in its action, is being used to some extent. The recommended rate of application is 5 to 10 lb per acre, though amounts in excess of this are frequently applied in Hawke's Bay. For maximum effectiveness the material should be applied to growing foliage so that it is absorbed into the plant and translocated to the roots, where it is most damaging. The appropriate time for applying the material is in autumn or spring, possibly both, depending on the degree of control achieved with one application.

Fertilisers and Liming

Various fertiliser programmes ranging from little or nothing to up to 10 cwt of sulphate of ammonia per acre have been applied to asparagus areas by growers in Hawke's Bay.

Responses to fertilisers vary on different soils depending on their degree of fertility, but liming requirements can be stated more definitely. Asparagus prefers a slightly acid soil, but will thrive in a neutral or a slightly alkaline one. If the soil is fairly alkaline, it would be wise to use a fertiliser which will tend to reduce its alkalinity, such as sulphate of ammonia, to supply nitrogen requirements. If the soil is acid, lime should be applied to bring the pH up to at least 6.0. Soil with a pH of between 6.0 and 6.8 appears to be most satisfactory.

Hawke's Bay asparagus growing soils have fairly high phosphate and potash tests, but maintenance dressings of fertilisers supplying these elements are advisable. Asparagus produces succulent stem and "fern" growth very profusely and nitrogen supplies should be kept at a high level. Some growers apply half the total fertiliser, especially nitrogen, in early spring to assist spear production and half after cutting ceases in December to assist fern growth and crown development for the next season. Other growers have claimed increased yields through application of organic manures and composts.

However, asparagus beds in the best of condition and heavily manured may still produce a low yield if the season brings dull, wet weather and cold nights. Rate of spear production is closely allied to soil temperature.

Raising of Seedlings

Some growers obtain their plants from nurserymen, who charge £6 to £7 per 1,000 for 1-year-old crowns. Others, however, prefer to raise their own, especially if a substantial number is required. Growing his own plants offers certain advantages to the grower: The plants are definitely cheaper, they are available exactly when required for planting, and there is not the same risk of their drying out.

Saving seed of asparagus presents a problem in the selection of parent plants. Asparagus is dioecious; that is, it has separate male and female plants, making the genetics of the species more comparable to animals than most other plants where the two sexes occur in the same individual. Asparagus plants are therefore very variable. Seed should be saved only from vigorous, high-producing, quality plants. Poor-producing male plants should not be allowed to produce pollen. These precautions are necessary to maintain the quality of a desirable strain of asparagus. Without them the strain will quickly decline. Seed should be obtained from a reliable source specialising in its production.

Experimental work overseas, particularly at the University of California, has shown that male plants produce slightly greater weight of spears per acre than female plants, while female plants on average produce larger spears which grade higher. The economic advantage has not been considered high enough to justify discarding the plants of either sex. More recently, however, a breeding method has been devised to produce an all-male line.

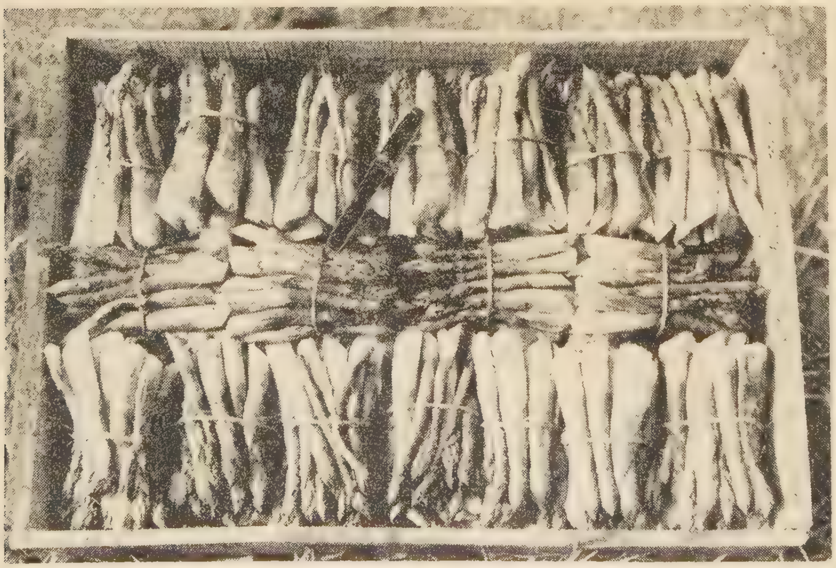
Seed saved from mature, bright-red fruit should be planted in well prepared fertile soil in early spring and the seedlings left to grow there until the following spring, when they are ready to plant out. The seed should be planted 1 in. deep in most soils and a little deeper in light sandy soils in rows 18 to 24 in. apart. A mechanical seed sower gives better spacing, and seed should be spaced 3 to 4 in. apart, as thinning asparagus seedlings is difficult. These spacings give strong plants which have not grown into each other to make separation difficult at digging time.

Cultivation at frequent intervals is necessary to control weeds, but deep cultivation is not needed and may damage the tender, fleshy roots. If a chemical weedkiller is used, cultivation need not be so frequent.

Asparagus seeds are rather slow to germinate, taking 2 to 4 weeks or more according to soil temperature, moisture conditions, and depth of planting. Soaking will speed up germination, but the seed should be dried first, then sown soon afterward to avoid loss of vitality.

The percentage of germination of asparagus seed is often fairly low. A spacing in the permanent bed of 7 ft x 18 in. will require 4,150 plants per acre and 8 to 9 lb of seed is sufficient to establish roughly 25 acres.

The crowns can be lifted with forks and the earth shaken off them at the same time, but it is better to plough them out first to free them and then shake the earth off with a fork. Using the plough is much quicker and less likely to damage the roots. When the crowns have been dug they should be kept covered so that they will not dry out.



Bunches of asparagus boxed and ready for lidding before being sent to market.

Varieties

Because of the factors mentioned in the section on the raising of seedlings the term variety in asparagus does not mean very much, it being better to think in terms of desirable strains.

The varieties of commercial culture are by no means distinct, but the following features are accepted by commercial producers in Hawke's Bay.

The original plantings in the district were mostly varieties called Connovers Colossal and Mary Washington. Both the Mary Washington and Martha Washington strains are resistant to asparagus rust, but the former is the more vigorous and has been favoured for this reason. In latter years two further strains called Paradise and Washington 500, bred in the United States from Washington stock, have been planted to the exclusion of all others.

Paradise is very vigorous and for this reason comes into production quickly; quite useful cuts can be taken in its third season. Washington 500 is reported to hold longer with the tip of the spear closed—an important attribute in large-scale processing.

A large, vigorous strain from the French Argenteuil stock, called Kidner's KBF, has been planted experimentally by one or two growers.

[Orr

Asparagus → being processed in a canning factory. After being washed and sorted the spears pass on a moving belt under revolving knives, the butts being discarded and intermediate cuts collected for soup manufacture. The whole spears travel on to be blanched and packed.

Pre-harvest Preparations

All cultural operations before spear emergence are aimed at obtaining weed-free crown rows, and soil with reasonable tilth so that spears emerge easily without any distortion. On large blocks the 30 lb lug boxes in which the cut spears are collected are stacked at convenient intervals along the access tracks. Where necessary markers are placed along fence lines and headlands so that cutters can locate their own rows without difficulty.

The commencing date for cutting the spears is governed by their emergence in worthwhile quantity and may be as early as the first week of September on the lighter, warmer soils, but is usually about the last week in September for heavier soils. Prevailing weather is the deciding factor. In some seasons several days' production may be lost through late frosts, as the succulent stems are very frost tender.

Harvesting Methods

Though mechanical harvesting is used in California and in other asparagus-producing areas, it has not been adopted in New Zealand.

Usually each spear is cut an inch or two below soil level with a chisel-like knife. A few growers believe that less damage is done to developing spears if the cut is made just above soil level. The minimum spear length is 6 in.

Cutting begins in the early morning about 5 o'clock and usually is completed well before midday, so that spears are obtained in the freshest possible condition. They are packed loosely into 30 lb lug boxes by the cutters and stacked on the headlands, from where they are picked up by motor transport on large blocks and taken straight to the factories. On small areas the full boxes are often brought to the packing shed on barrows. Where asparagus is grown on large areas for factory processing, half of each cutter's area is cut over each day. Thus all parts of the block are cut once every 2 days.

Asparagus for Fresh Market

The loose spears are trimmed and bundled into ½ lb or 1 lb packs with rubber bands. The bundles are packed tightly into bushel boxes and sent to auction markets in all parts of the North Island, but chiefly Wellington. Asparagus which is held over the weekend is sometimes cool stored or stood butt end down in shallow water baths. Half-pound bundles are usually packed only in the early part of the season when prices are high. Fresh market prices average about 1s. a pound in normal seasons. Growers with under 10 acres dispose of the greater part of their crop by this method.

Asparagus for Processing

After arrival at the canning factory the loose, ungraded asparagus is placed immediately in cool store at a temperature of 36 degrees F. and fed out as quickly as possible to the factory production lines to conserve flavour and freshness. The spears are first cleaned in a spray washer, then on a moving belt the butts are sliced off, and the spears are sorted into three first-grade sizes (thick, medium, and thin) and a second-grade by women operators.

The butts are dumped as waste, but the tender intermediate sections are made into asparagus soup. After going through a blanching process to assist in holding the colour the spears, still on the moving belt, are then packed by hand into cans. The packed cans are filled with a salt and sugar solution and next pass through an exhaust box (steam chamber) which creates the necessary vacuum in each can before it is capped in a rotary machine. Finally the filled cans pass through an automatic pressure cooker and after cooling are labelled and packed into cartons ready for dispatch.

Quick-freezing asparagus is a somewhat simpler process in that after being washed and sorted the spears are trimmed, blanched, and packed in cartons. The packed cartons are then quick frozen.

Future Prospects for the Industry

With a virtually untouched overseas market the future prospects for the export of processed green asparagus are very bright indeed. Much larger acreages are needed of course; and there is no doubt that if more careful attention is paid to the establishment and manuring of the crowns after planting on suitable soils with good drainage, yields can be increased to at least 2 tons per acre. At present average district production is a little over 1¼ tons per acre.

Asparagus is a long-term crop, and after costs of establishment are met overhead expenses are not unduly high when taken over the crop's producing life of at least 25 years.

References

Homer C. Thompson, "Asparagus Production", 1946.

R. I. June, "New Zealand Journal of Agriculture", vol. 83, p. 137, 1951.

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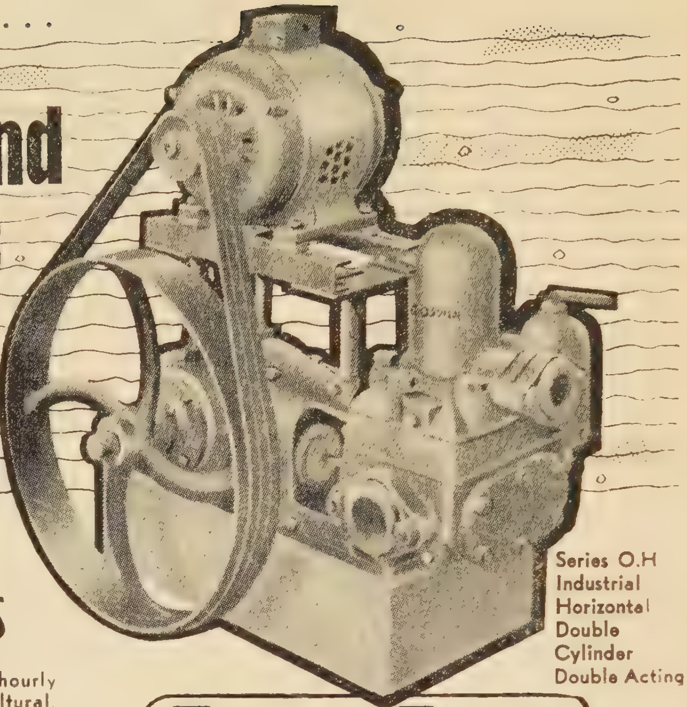
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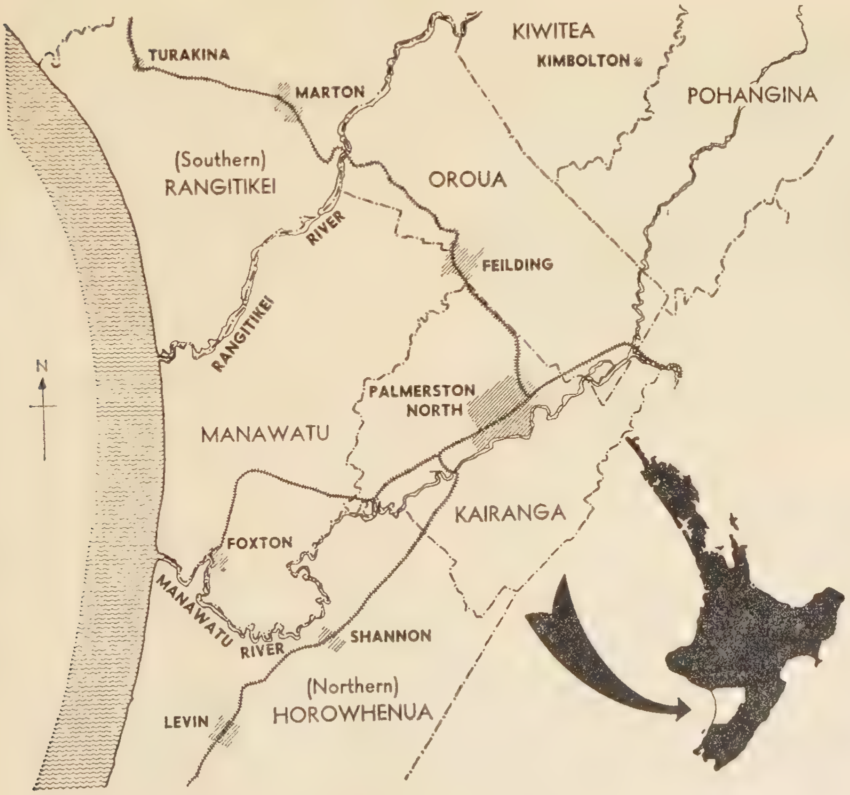
Beekeeping on the Manawatu Plains

By L. H. JOHNSON,

Apiary Instructor, Department of Agriculture, Palmerston North

SINCE commercial beekeeping was started on the Manawatu Plains more than 50 years ago hundreds of tons of good-quality honey have been secured, and honey from this district has been awarded the maximum points for grade. Over the past 10 years honey returns in the Manawatu appear to have been below the Dominion average. Though it is not claimed that the Manawatu will ever yield nectar as consistently as some other parts of the Dominion, better returns could be obtained with better beekeeping.



THE Manawatu Plains extend from Levin to Turakina and inland to the ranges and include the following counties:

The northern part of Horowhenua, Manawatu, Kairanga, Oroua, Kiwitea, Pohangina, and the southern part of Rangitikei. On the western side the plains are open to the sea and on the eastern side are bounded by the central dividing ranges.

There are more than 1,000,000 acres of rich pasture land where comparatively little cropping is done, but which carries a very large livestock population.

Climate

The climate with a well distributed rainfall is ideal for promoting pasture growth. Generally, long periods of dry, warm weather are rare. The annual rainfall is not heavy, 38 in. at Palmerston North and less in the Rangitikei. Sunshine recorded near Palmerston North averages 1,817.7 hours per annum. This is near the ranges where cloudy conditions so often prevail. A few miles nearer the coast the hours of sunshine are well over 2,000 annually and compare favourably with the best in New Zealand.

Nectar Secretion

The conditions favourable for maximum nectar secretion from white clover are:

1. A warm soil.

2. Two or three weeks of warm sunny weather in January, the all-important month.

Generally a dry season is more favourable than a wet one. The highest nectar yield on record has been during a long drawn out season with consistently warm day and night temperatures, warm rain at intervals, and very little wind.

As most of the pastures are grown on heavy soils, it often takes two or three weeks of warm temperatures to warm the soil sufficiently for the clover to yield nectar. The response to temperature on the light soils is much quicker.

Soil types and weather that produce abundant luscious growth and a lot of clover bloom on long stems may give a disappointing nectar yield. Too much grass is inclined to smother the clover and to keep the surface shaded. Short-stemmed clover bloom on sheep country often gives a better yield than on dairy pasture. Some seasons when the countryside has a good scattering of clover bloom the returns have been very disappointing.

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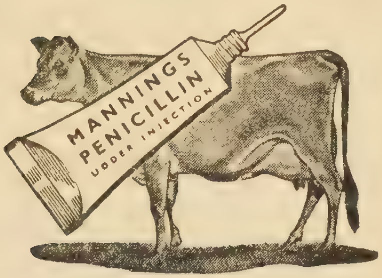
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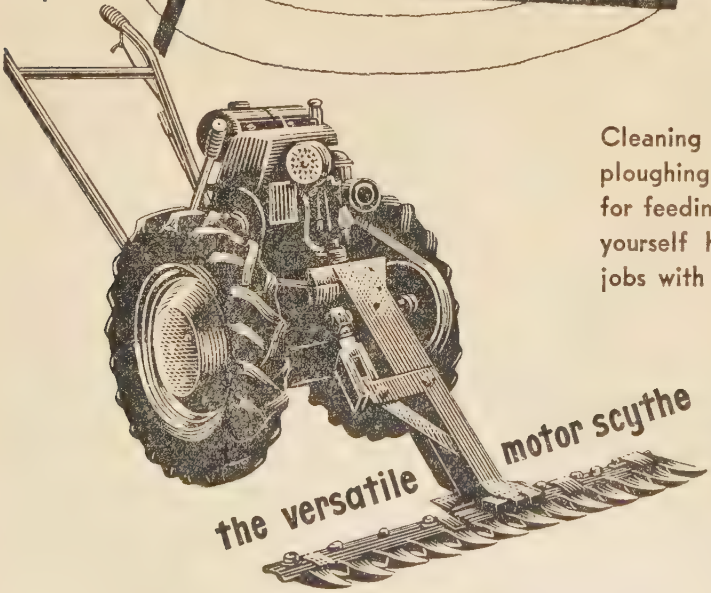
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In easterly weather there may be bright sunshine day after day, but very little nectar flow. A light westerly wind is warm and is better for nectar yield provided the skies do not cloud over too much. Northerly weather is ideal for nectar secretion, but, unfortunately, it does not last long.

In January warm northerly weather has suddenly swung to a three-day southerly with rain which has abruptly cooled both the atmosphere and soil, cutting off the honey flow which has not recovered for the rest of the season. Such uncontrollable factors make beekeeping somewhat precarious in the Manawatu, where there are more lean seasons than bumpers.

White clover (*Trifolium repens*) → in flower in the Manawatu. Pastures of this type yield more nectar during a long drawn out season with consistently warm day and night temperatures, warm rain at intervals, and very little wind.

Poor Returns

There are other contributory causes to poor returns as well as the climate. These are:

Short-stemmed white clover → (*Trifolium repens*) in bloom on pastures which had been grazed by sheep in Rangitikei district. Short-stemmed clover on sheep country often gives a better nectar yield than on dairy pasture.

Much hive management has fallen short of scientific.

In many apiaries second-rate queens are tolerated.

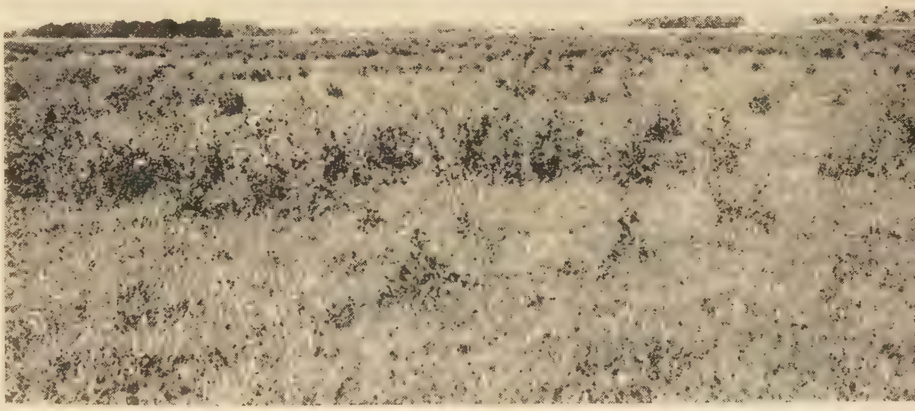
Too much artificial feeding has been practised.

Pollen shortages have not been readily recognised and provided for.

Many of the apiary sites have been badly chosen.

Much apiary equipment has been substandard.

Other factors, outside the beekeeper's control, have been inadequate drainage of the subsoil, insufficient shelter, and overstocking pastures with sheep.



Scotch thistle (*Cirsium lanceolatum*) → has become very widespread throughout the Manawatu. Thistle blooms late in the season and yields a water-white honey.

White clover has been very patchy, some paddocks being almost white and adjoining areas having scarcely any heads visible. Pasture management can be responsible for this, as in the all-important nectar yielding period when clover bloom appears at its best a farmer may move sheep on to the pasture and the bloom is gone in less than a week.

Land Development

Land development is removing or modifying some of the disabilities of beekeeping in the district. Drains have been cut or deepened by machinery and tile drains have been laid mechanically. Subsoils are therefore drier and respond more quickly to warm temperatures than formerly, factors which greatly improve nectar secretion in white clover.

The provision of more shelter belts should reduce the loss of field bees in strong winds. Many pastures which had run out or had been partly covered with weeds have been cultivated and resown.

Closer settlement also affects the nectar supply, as round new homes trees, hedges, shrubs, vines, and flowering plants are soon established. Those that yield nectar in spring are a decided help to nearby apiaries.

Overstocking

As far back as 1920 some beekeepers claimed that their districts were overstocked with bees and joined with others who proposed the licensing of apiary sites. The fallacy of overstocking has been proved since, as in a fair season there is more nectar than there are bees to collect it, and in an adverse season an isolated few hives may secure a light crop.

A limit cannot be set on the hive holdings that should be in a given area, but each beekeeper will continue to operate in a district as long as he gets payable returns.

Hive Holdings

In the past seven years three commercial beekeepers have moved 1,230 colonies of bees to other districts and there has been a decline in the hive holdings of many sideline and domestic beekeepers. However, during the last two years several new beekeepers have established apiaries and this season have secured really worthwhile returns.

Notwithstanding the difficulties of beekeeping on the Manawatu Plains hundreds of tons of honey have been produced, some of it being awarded the maximum points for grade. It is not claimed that the Manawatu will ever yield nectar as consistently as in some other parts of the Dominion, but better returns could be secured. Some beekeepers continue to get payable returns while others average less than 3 tons of honey per hundred hives.

Energetic men well trained in modern beekeeping may secure half as much again or double the quantity of honey secured in the past.

Five Important Factors

If honey production in the Manawatu is to be substantially increased, the following five factors are important:

1. Limited Nectar Supplies in Spring

Areas like Kairanga have very limited supplies of nectar until the clover blooms in late November or December. Reserves of comb honey are necessary to bridge this gap during the all-important period of building up colony strength.

A pollen shortage in spring is also common. When this occurs queens almost stop laying and colony strength quickly diminishes. Often it is not possible for weakened colonies to build up in time to be of much use for the honey flow. Combs should be sorted in the autumn and those heavy with pollen may be set aside for spring supplies.

2. Supering Too Early

Supering too early has been all too common. Colonies will winter well in two-storeyed units. These will hold a lot of bees in the spring without being overcrowded. Add supers one at a time; putting on three at one time only retards colony expansion.

3. Uniting Colonies

More attention should be paid to uniting colonies, not just putting together two weak units, but many of those in fair order could be further reinforced with bees. This extra hive manipulation will definitely pay.

4. Shelter

The prevailing wind that sweeps the plains is from the west, but in most districts adequate natural shelter is available. Colonies should be placed in the open rather than near trees where there is a ground draught. In areas without good natural shelter more could be done with artificial protection. A post and rail fence sheathed with rough timber or bitumen drums that have been cut down and flattened will give some protection.

5. Consumption of Honey in Autumn

The honey flow often cuts off fairly suddenly, as there is very little after the clover finishes. Where extracting is left until February or March or later, and colonies remain very populous, a whole super of honey may be consumed by the bees in each unit.

Where queen excluders have been used wisely, brood rearing can be limited during the honey flow so that when the season ends there will not be a strong force of field bees as consumers. Every endeavour should be made to get the colonies down to two storeys as soon as the honey flow is over or honey will be consumed needlessly.

Flooding

Near the Manawatu River flooding has not taken a heavy toll of apiaries, as most are on sites above flood level

Disease

Losses through foul brood disease (*Bacillus larvae*) are not very great. The average for the district is about 2 per cent of all colonies.

New Beekeepers

Prospective beekeepers are advised to begin right. Use standard, precision-made equipment and protect it with three coats of paint.

Do not buy secondhand sub-standard equipment, as it may be with you for years.

Good and Bad Seasons

To stabilise the income through the great fluctuations in seasonal honey production, beekeepers should aim to carry through a stock of bulk honey equal to 75 per cent of an average season's honey crop.

◆

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during January 1959 and for the 6 months ended 31 January 1959 with comparative figures for the same month and the 6 months of 1957-58 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage Inc. or dec.
January 1959	21,472	347	21,819	—
January 1958	21,877	365	22,242	—
Decrease	—405	—18	—423	—1.902
6 months ended 31/1/59	129,288	1,827	131,115	—
6 months ended 31/1/58	127,376	1,952	129,328	—
Increase or decrease	+1,912	—125	+1,787	+1.382

Butter in store at 31 January 1959 was 33,406 tons

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage decrease
January 1959	7,750	1,891	9,641	—
January 1958	10,380	1,839	12,219	—
Increase or decrease	—2,630	+52	—2,578	—21.098
6 months ended 31/1/59	41,799	10,161	51,960	—
6 months ended 31/1/58	51,946	8,860	60,806	—
Increase or decrease	—10,147	+1,301	—8,846	—14.548

Cheese in store at 31 January 1959 was 18,255 tons

If these figures are converted into butterfat equivalent, there is an increase of 1.403 per cent in butterfat graded for the 6 months as compared with the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place they are not necessarily a true indication of production trends.

Tractor Operating Costs

Hourly operating costs of tractors have been computed for farmers by the Department of Agriculture for several years. Farmers who wish to take advantage of this service should apply for the standard forms on which they set out the information required by the Department to calculate results, which are then notified to participating farmers. Forms can be obtained by writing to: The Fields Superintendent, Department of Agriculture, Auckland, Palmerston North, Christchurch, or Dunedin.

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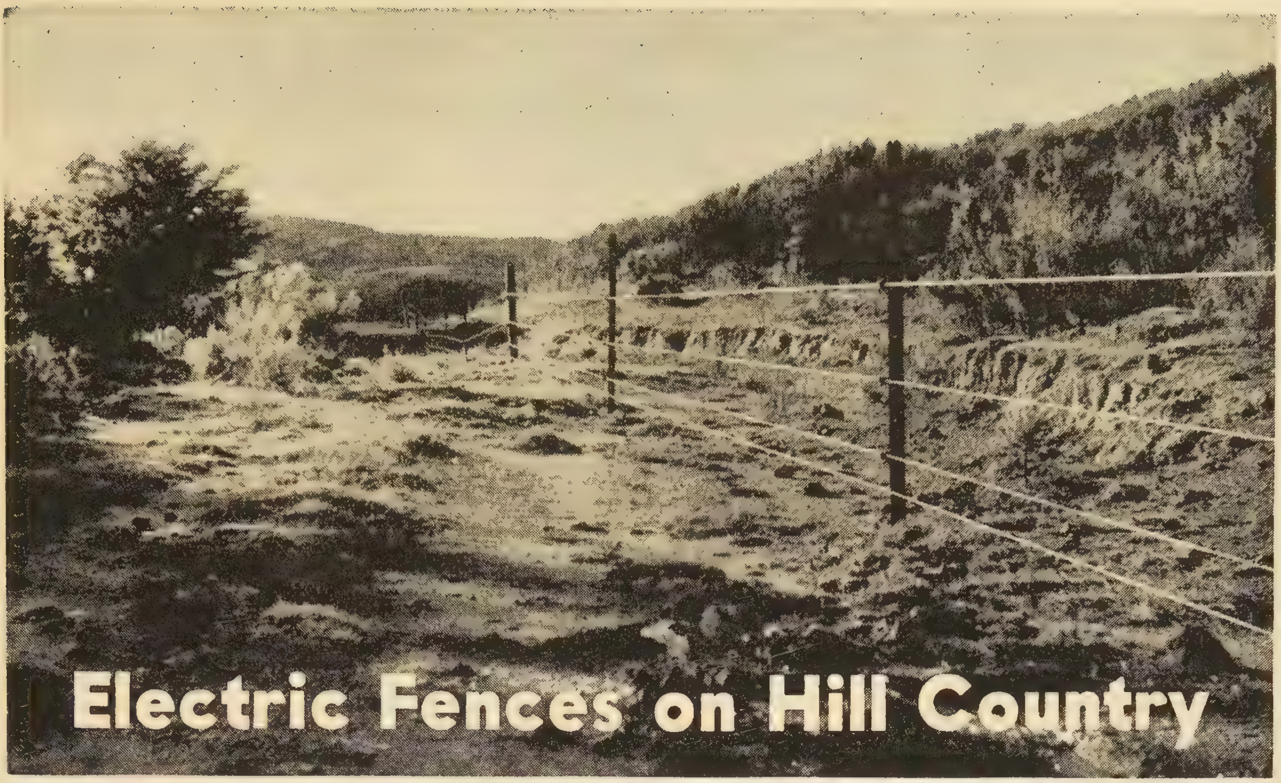

Electric Fences on Hill Country

HIGH costs and difficulties in securing suitable materials for the standard type of post and wire fence have recently caused a revival of interest in the use of electrified fences for sheep and cattle on hill country. Some of the technical problems involved in the erection of permanent electric fencing on hill country are discussed in this article written by R. G. Warren, Dannevirke, in conjunction with G. R. Moss, New Plymouth, and A. K. Booth, Wanganui, all three Instructors in Agriculture of the Department of Agriculture.

IT is now more than 20 years since the idea of using electrified wires for fencing for livestock control was first introduced to this country and it was shown that practically all kinds of farm livestock could be restrained by this type of fencing. An excellent article on use of the electric fence for the subdivision of hill country by Mr C. S. Brook, of Te Kuiti, in the June 1939 issue of the "Journal" and an investigation of developments in the use of the electric fence carried out by the Department of Agriculture in 1940 and recorded in a series of articles in the "Journal" in that year indicated that farmers considered the electric fence had a great future.

Widely Used

Investigation showed that the electric fence was being used effectively on dairy farms for the subdivision of large paddocks and for the control of pigs, bulls, and horses, and on fat lamb farms for the break feeding of crops and in some cases for subdivision of paddocks for grazing management. Of most interest, however, in connection with hill country fencing at present, was the fact that various types of electric fencing were being used for different purposes on hill country in almost every district.

Among the many uses of this type of fencing in early 1940 were the fencing off of shady faces and rough areas for better cleaning up, the fencing off of awkward gullies, streams, and plantations, and, of most importance, the use of the electric fence for the permanent subdivision of farms, especially on areas where closer subdivision of scrub and fern country was necessary for improvement by grazing management. In this case the advantages of low cost per mile, ease of erection, and effectiveness in controlling sheep as well as cattle, if the fences were well erected and consisted of at least three wires, were stressed by farmers with experience of this type of fence.

The extreme shortage of fencing wire and mounting costs of materials due to the war were expected to lead to the general adoption of the electric fence for permanent subdivision of all types of farms, but this did not happen. Even as early as 1936 a system of permanent subdivisions, after a short trial, was rejected on some dairy farms in favour of a portable electric fence controller and the use of movable electric fencing for the break feeding of pastures and crops and temporary subdivision for better grazing control.

When it was found that a single light-gauge plain wire, if properly electrified and insulated, would control dairy cows effectively, this type of electric fencing was adopted generally and has remained as the main use of such fencing on dairy farms. Today few dairy farmers do not use a portable electric fence.

Only recently has the use of the electric fence for better grazing management with sheep and cattle again received serious attention, as those hill country farmers who were enthusiastic about the possibilities of electric fencing and were using it for what were intended as permanent subdivisions in the late 1930s and early 1940s have apparently all reverted to standard subdivision fences. The use of any sort of electric fence has not developed generally on sheep farms as it has on dairy farms, despite the fact that such fencing, properly erected, has been quite effective in controlling both sheep and cattle and could be erected for about a quarter of the cost of standard seven-wire fencing.

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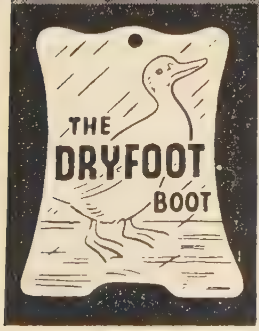

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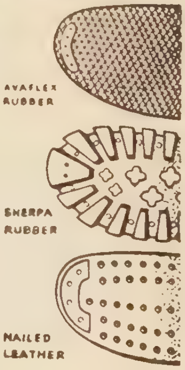


Shall I Build an Electric Fence?

We are now in the midst of the second stage of development of the electric fence for use on hill country. Technical improvements are being made all the time, and it is a problem for a farmer to decide whether or not to include the erection of electrified fences in his fencing programme. It is equally difficult to help farmers in the solution of this problem. However, the following suggestions may serve as a guide.

IF you are not mechanically minded and interested in tinkering with gadgets, leave the electric fence well alone in the meantime.

* * *

IF you are not prepared to adapt your management to so frail a fence, the electric fence will be of little use to you.

* * *

IF you own cattle that are wild and difficult to manage, keep to normal fencing.

* * *

IF you have back country which is inaccessible and where secondary growth is a problem, use normal fencing methods.

* * *

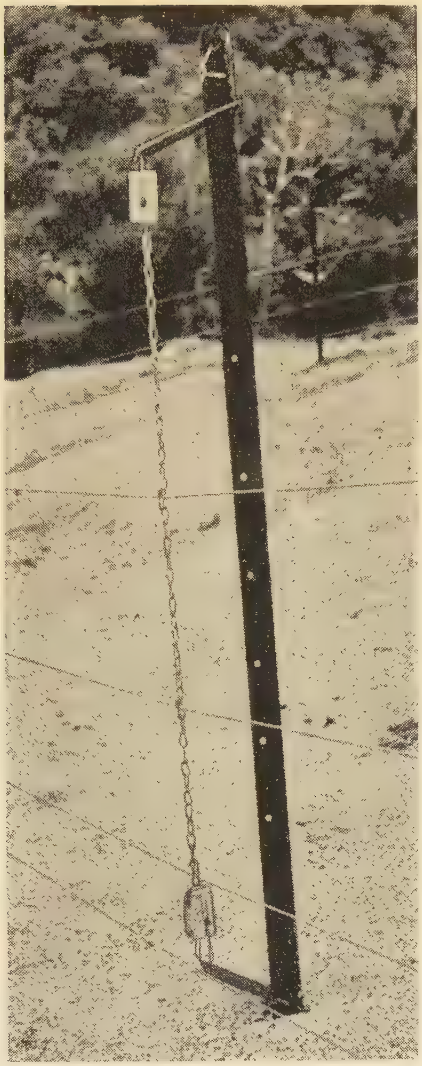
IF you forget that weeds and grasses must be sprayed or cleared before they touch the lowest electric wire, you will have overlooked the most important of the problems that yet remains unsolved.

* * *

IF you are faced with a heavy fencing programme and dwindling capital; if you are prepared to plan and build your fences carefully; to carry out regularly the maintenance that they require; and to be patient with your dogs when mustering, the electric fence could be of very great value on your farm.

The reasons for the failure of electric fencing for permanent subdivision on sheep farms are many and varied. Generally, however, the main weakness was that such fencing, as originally erected, was unreliable under all conditions of weather, soil, and location and it required too much care and attention from the farmer to keep it working effectively for the proper control of stock.

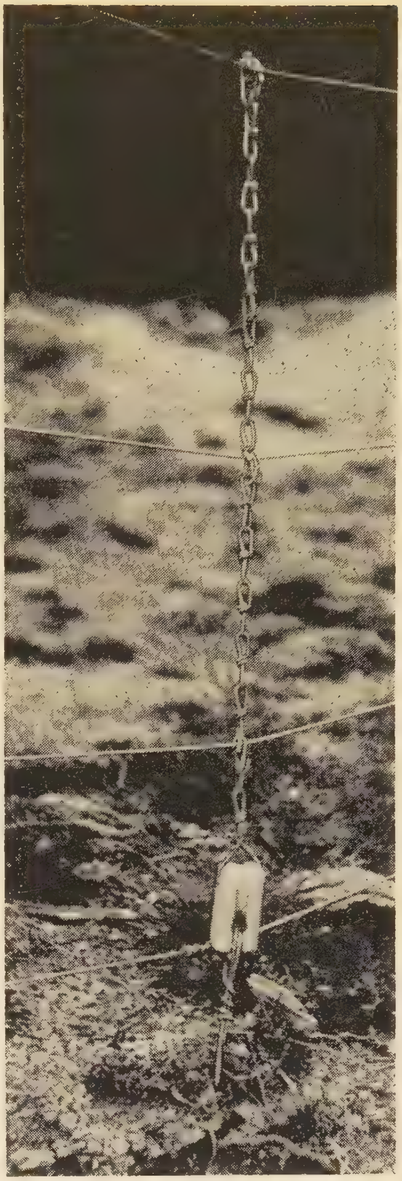
There has recently been a revival of interest in the possibilities of the electric fence for the permanent subdivision of hill country and sheep farms generally. Reasons have been the increasing difficulty of obtaining suitable fencing materials, the high cost of hill country fencing, and what are considered to be important improvements in the electric fencing itself, which may eliminate the causes of past failures.



A new method of attaching electrified wires to metal standard.

Massey College Fence

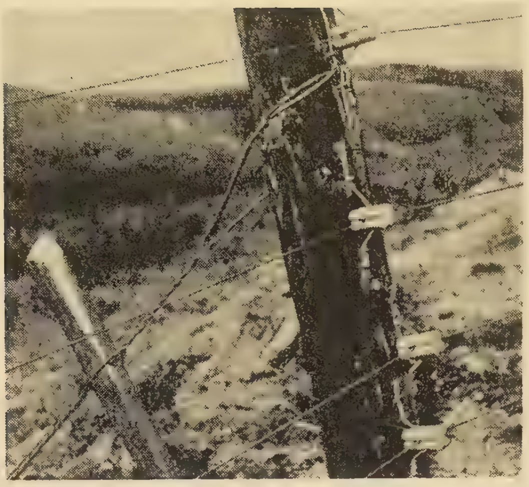
At the Massey Agricultural College hill country farm, "Rata", in southern Hawke's Bay an electric fence intended to be permanent has now given very satisfactory service for more than a year on steep country. Full details of this fence were given in papers at the College's 1958 sheep farmers' conference, and the interest in the possibilities of permanent electric fencing of this type was shown by the subsequent influx of farmers to "Rata" farm from all over the country to see the fence and learn the methods used in its construction. Similar fences are now being erected in other districts.



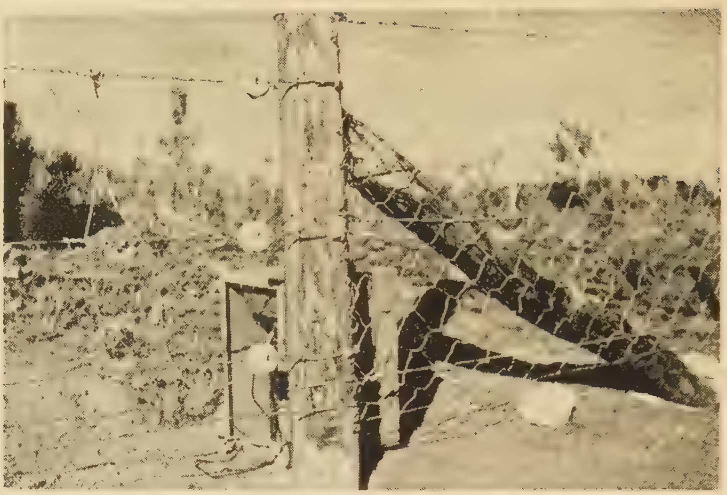
Footed Hunter chains are quite satisfactory where an electric fence crosses a dip in the ground. Notice that the lowest wire is an earth wire.

The following are the main features of the "Rata" farm electric fence, which it is considered will provide for effective control of all types of stock and at the same time give a permanent structure with a minimum of maintenance at a low initial cost per mile.

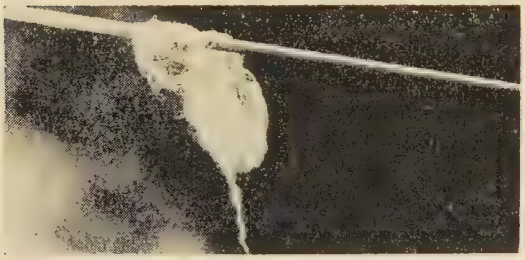
Insulators and Insulation



An angle post in an electrified fence. Notice that the fence wires are attached to the inside of the post and that they pass through the loops of wire supporting the insulators.

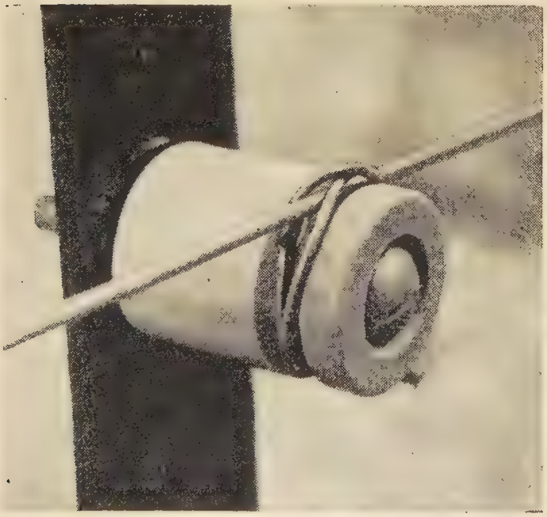


Good porcelain insulators last well. The strainer is stayed away from the electric wires so as not to obstruct them.

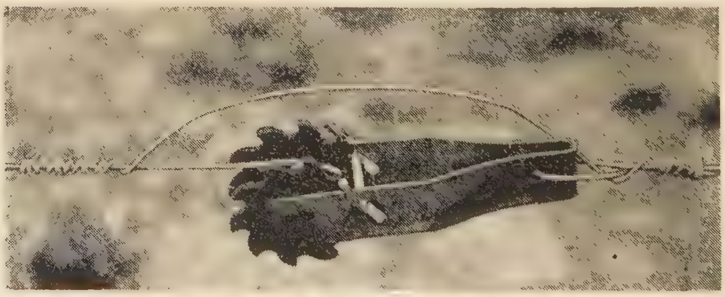


Pieces of wool sometimes catch on the wires and may cause leakages of power if blown against insulators and soaked with rain.

Small sticks and leaves blown by the wind, spider webs (as shown), and plants touching the live wires can all cause losses of power, particularly under wet conditions, thus reducing the efficiency of a long electric fence.



Small porcelain insulator bolted to a steel standard.



The electrical resistance of the Hayes-type strainer can be high and the loop of wire has been added to allow the current to travel freely.

All the photographs on this page were taken at the Massey College "Rata" farm in southern Hawke's Bay.

Clean Line

The fenceline was cleared with a bulldozer for ease of erection and with the idea also of the line being kept clear in future by periodic spraying or cutting of any vegetation which might grow up alongside the fence and short circuit the current.

Permanent Materials

The materials used are as permanent as those of a normal fence. The first section was built with posts on the rises and in the dips, but later sections have steel standards on the rises and insulated Hunter chains in the dips, with wooden posts for angles and strainers.

Earth Wire

The four wires are 12½ gauge galvanised steel, three being electrified and the fourth (the bottom wire) being earthed at each standard and Hunter chain foot. This ensures that a full shock is felt when any section of the fence is touched, even in the driest weather. Hayes permanent strainers are used to keep the wires separated and the Hunter footed chains tight. Galvanised steel wire has been used in preference to normal galvanised iron wire because the latter has been found to stretch too much and cannot hold the necessary tension.

Charging the Wires

The fence controller is powered by a special alkaline battery (guaranteed for 20 years) which is kept charged by a wind-driven generator. With this equipment there is less servicing of the battery and other maintenance.

Gateways

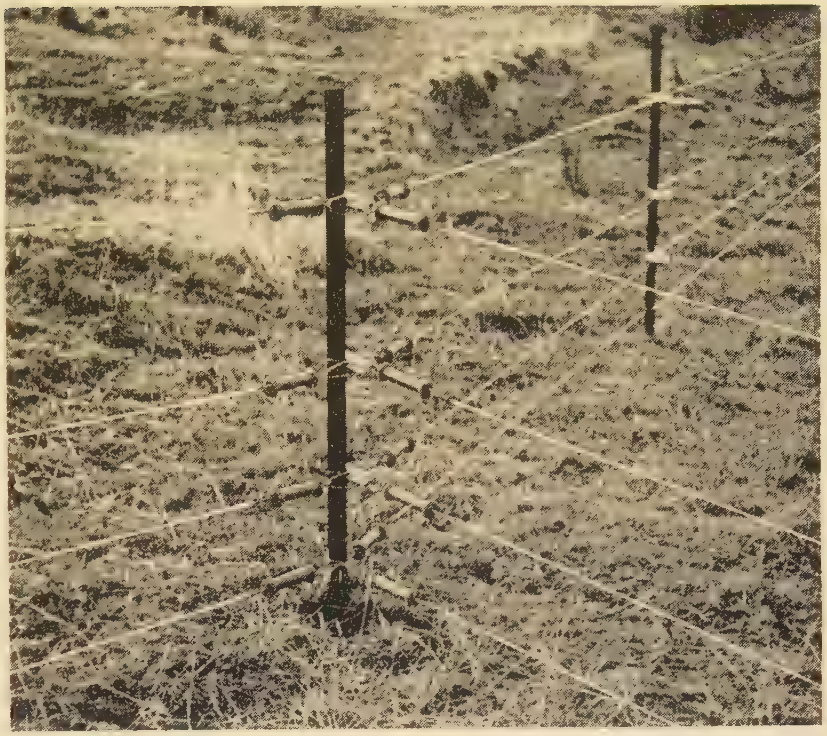
For a distance of one chain on either side of gateways, normal fencing replaces the electric fence, which is liable to be damaged by cattle when they are forced up to and through the gates. The current is carried over the gateways on insulated poles and the earth wire is taken across under the ground.

Insulation

Reliable porcelain insulators are now being used because some of the original plastic types deteriorated badly.

Precautions with Livestock

Experience with the "Rata" fence has shown that it is wise to electrify each section of fence as it is built or to remove stock from the area while putting up the fence. Stock should be allowed to become used to the electric fence, cattle being given time to test the fence before they are mustered near it, as the fence is not sufficiently noticeable for them to see it and not strong enough to withstand the pressure of mustering stock against it. Sheep are best trained to respect the electric fence by the use of a section of electrified fence to hold



▲ The method of constructing gateways in an electric sheep fence. The top wire is left attached when sheep are passing through so that the fence on either side of the gateway remains electrified.

▼ Sheep walking through a gateway in a permanent electric fence on Mr G. Ramsden's property at Kumeroa.

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them in the yards immediately after shearing.

Costs and Efficiency

The "Rata" fence was built for less than £160 per mile, excluding the cost of the normal fence sections, the gates, fence controller unit, and wind charger. So far the fence has satisfactorily controlled both sheep and run cattle.

Fence near Waiouru

The actual cost of 3 miles of permanent electric fencing erected on flat to rolling tussock country near Waiouru is listed below. This fence consists of four live wires and an earth wire, with wooden strainers, angle posts, and stays, and steel standards at intervals according to the contour of the ground.

	£	s.	d.
Bulldozing line	16	10	0
Labour, 407 hours at 6s. ..	122	2	0
13 angle posts and 27 stays ..	18	0	0
14 strainers (small, £2 10s.) ..	35	0	0
25 Hayes wire strainers at 3s. 4d.	4	3	4
240 (5 ft 6 in.) steel standards at 5s.	60	0	0
Freight	4	0	0
1,200 chains of 12½ gauge wire	83	0	0
Windcharger	56	0	0
Electric fence unit	10	10	0
Battery	3	14	2
¾ coil of Hunter chain ..	6	0	0
80 dozen insulators at 4s. 10d. per dozen	19	6	8
108 insulators at 1s. 11d. ..	10	7	0
90 tie-down insulators	4	10	0
80 dozen nuts and bolts at 1s. per dozen	4	0	0
Tie wire		10	0
100 ft of No. 144 automobile cable	2	10	0
Transport to work	5	0	0
	465	3	2

The cost per mile for this fence works out at £155 1s., but if this fence had been designed for really rough country, a greater number of steel standards would have been required and so the cost would have been slightly higher.

Fence near Gisborne

On hill country in Poverty Bay ½ mile of a similar fence has been erected. Though no charger was bought, the cost was £135 or £270 per mile. In this fence barbed wire was used for the electrified wires and the number of standards was much greater than in the two fences already discussed.

Progress and Problems

From the foregoing it can be seen that there have been two stages in the development of electric fencing for sheep farm subdivision. The first was a period of pioneer experimenting, with enthusiastic farmers testing equipment of a primitive design; equipment which became very scarce with the advent of the war and which in any case had not been designed specifically for the purpose for which it was being used.

The second stage of development began during times when equipment and money were available for experimenting and when the attention of commercial firms, farmers, and research scientists could be fully focused on the problem. We are now in the midst of this second stage and already certain fundamental points have been established:

- Sheep and cattle, once trained, can be controlled effectively on hill country with an electric fence of the most recent design.
- Practical and reliable methods of providing electricity for fence controllers have been designed, thus removing the need for the constant attention necessary when batteries had to be taken home at short intervals for recharging.
- Effective electric fences for subdividing hill country can be erected for less than a quarter of the cost of the normal type of fencing.

Problems

Apart from the shortage of equipment arising from import control, two main problems directly concern any farmer considering erecting electric fencing on his property.

- How much work will be involved in keeping the fence in running order and free from short circuits?
- How much risk is there of careless shepherding causing stock to break through and damage the fence?

If the latest type of electrical equipment is used, the fence controller and power supply can operate unattended for 2 to 3 months. However, until satisfactory automatic fault indicators are available it is probable that the fencelines themselves will need **regular** checking for short circuits and power leakages, the intervals between checks being governed largely by the amount of trouble being experienced.

It is to be expected that hand clearing or spraying of fencelines will be necessary where grazing is lenient and vegetation grows quickly. Power

Equipment set up → to demonstrate an automatic fault-detecting switch (in centre box) which switched on the trafficator if a short circuit occurred on any part of the fenceline. The cylinder at left contains a fence unit powered by semi-dry batteries.

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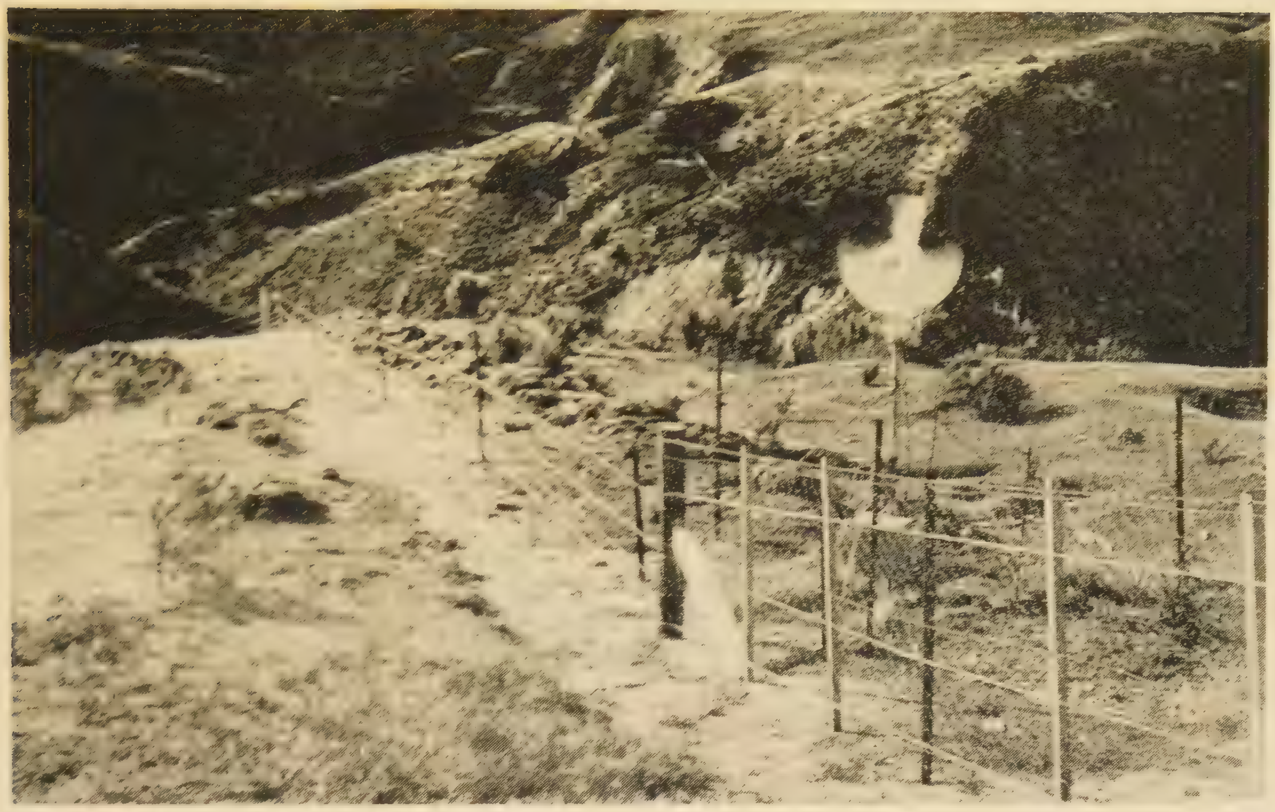

The electric fence on "Rata" emerging from a steep gully to meet a chain of netting fence alongside a gateway. At right are the fence controller, alkaline battery, and wind charger.

Leakages and short circuits may also occur where sheep's wool becomes caught round the wires near the insulators and is dampened by dews or rain.

In wet weather small leakages caused by faulty insulation, pieces of wool, spiders' webs, and windblown sticks or branches could all combine in a long fenceline and seriously reduce its effectiveness.

A new attachment for fixing electric fence wires to steel standards has recently been placed on the market. Two brackets, one at the top of the standard and the other at ground level, hold between them an insulated length of Hunter chain to which the fence wires are clipped. In a five-wire fence the number of insulators is cut by half and consequently the leakage of power is reduced by half.

Once an electric fence has been erected careless shepherding could be disastrous. However since the electric fence is so cheap and easy to repair, its advantages often would outweigh the risk of an occasional breakthrough.

Great care would be needed when mustering near a new fenceline, but later when the stock were fully aware of the position of the line, a breakthrough would be most unusual unless stock were thrown into a panic or pushed against the fence by their fellows. As a 12½ gauge steel wire is stronger than a No. 8 iron wire, a well built electric fence will be reasonably strong.

There is a risk that certain cattle beasts may, having broken through the fence once or twice, become shrewd with the passing of the years and lose their fear of the electric shocks. Fortunately no trouble of this sort has so far occurred.

Shock Limits

It has been found most effective when training sheep to increase the shock speed from the normal 70 to 75 shocks per minute to 120 to 150. However, there are limits to the amount of power which it would be safe to pass through fencelines because of the possible danger to humans, particularly children. This should be noted especially by any electrical enthusiast who is planning to immerse any animals daring to touch his fences in a cloud of sparks. At present it is illegal to operate mains-supply electric fence controllers at more than 71 pulsations per minute, but battery operated units may be run at the higher speeds.

Construction Details

Since many miles of fencing can be electrified by one controller it is a good idea, particularly on a large farm, to make a rough plan of where electric fences could be erected, to make the best use of each controller and keep to a minimum the work involved in fault finding.

If the controller is in the centre of a fencing system so that the fences radiate from the controller, a shepherd could isolate each fence in turn and so locate a faulty section. Under these circumstances four long multi-wire fences could be connected to a single electric fence controller.

Well insulated, long electric fences tend to improve the shock from an electric fence controller because of the increase in capacity. With each pulse of the controller the fence stores up energy momentarily and behaves in the same way as a condenser. This effect is quite noticeable on the long electric fences erected at "Rata" and Waiouru. The shock at the far end

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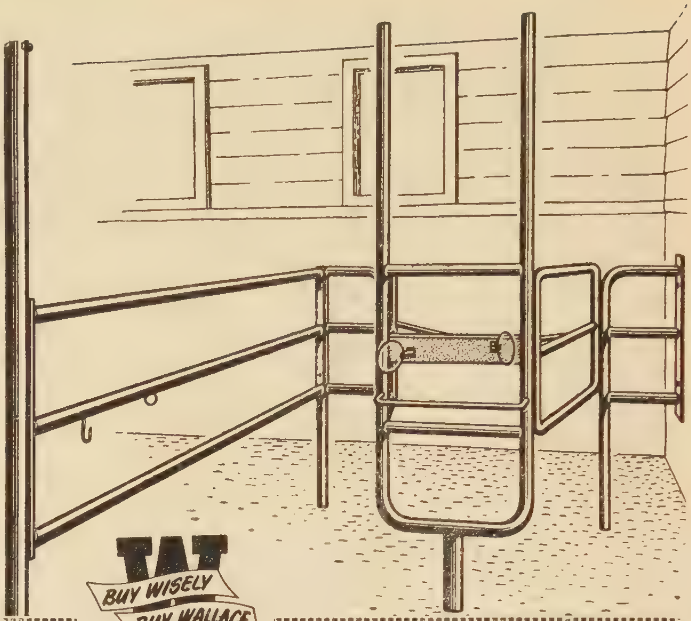

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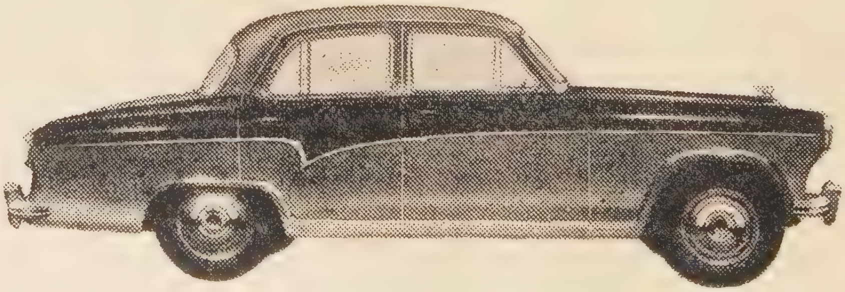

of a 5-mile fence is just as effective as the shock at the controller end when an earth wire is used throughout the full length of the fence.

Two controllers should not be connected to the one fence in an effort to obtain more shock, because one fence controller cancels out the shock of the other.

Normal Fencing at Gateways

Where cattle are being run it is strongly recommended that lengths of non-electrified normal fencing should be used on either side of gateways, because it is very difficult to handle mobs at gateways bounded by electrified fencing. Normal fencing should be used, too, across very broken ground (such as down banks and over streams), as electric fencing is quite unsuitable for these conditions.

The overhead electric wire should be well supported and held high enough to clear traffic through gateways.

Preparation for Fencing

The proposed fenceline should be pegged out as straight as possible to reduce the number of angles, and very sharp corners, where stock might be trapped during mustering, should be avoided.

If the ground is irregular and scrub or other vegetation is likely to be a nuisance, the line should be bulldozed. Common sense and experience of local conditions can be helpful here, as a rough, grassy surface may, for instance, provide better fencing conditions than a flat, muddy track.

Where the Hunter chain method is used to attach the wires to the standards the work of clipping the brackets, insulators, and chain together ready to fit to each standard can be completed indoors on wet days and the assembled units taken on to the job complete.

Type of Wire

Except in very cold regions, where contraction may break the wires, 12½ gauge galvanised high-carbon steel wire is probably the best wire available for permanent electric fencing. This light-gauge wire is cheaper, easier to handle, and just as effective as barbed wire.

As tight knots may break this wire, it is advisable to use the rounded type of insulator on the strainers rather than the narrow type of insulator used on the angle posts.

Figure-eight knots should not be used to join lengths of high-carbon steel wire.

Spacing of Wires

The spacing of the wires depends on the number of wires used. For a 4-wire fence the best spacings (from the ground) are 5 in., 5 in., 8 in., and 10 in. and for a 5-wire fence spacings of 5 in., 5 in., 7 in., 8 in., and 11 in. It is now recommended that at least 5 wires should be used.

The controller, battery, and wind-driven electric generator used by Mr W. Harding to electrify 3 miles of permanent electric fences on his Waiouru property.

Earth Wire

On dry hill country it is essential to run a continuous earth wire throughout the length of the fence. This earth wire serves two purposes: Firstly, it ensures that the maximum of shock current will pass through an animal touching any live wire at any point along the fence. Secondly, by running an earth wire 5 in. above the ground, the lowest live wire can be kept 5 in. further from the grass than it would otherwise be.

Tie-downs

Insulated Hunter chain droppers costing approximately 2s. 6d. each are excellent for traversing small gullies economically and also enable the wires to be pulled down into depressions between the steel standards. A simple footing device designed to drive in and lock in the ground should be available to farmers soon.

Location of Fence Controller

The controller-battery unit can be located anywhere along the fence, but it is better to install it in an accessible position where the pulse speed can be varied when necessary and the battery water level checked from time to time. If a wind charger is used, it should be in a position not too exposed to gale force prevailing winds, but fully exposed to other winds.

All the electrical supply and control equipment should be fenced off to prevent stock from interfering with it.

Isolating Faults

Where strainers are inserted in long, straight fences it is advisable to fit a double set of insulators on each strainer, one set of live wire insulators being used to terminate one section of the fence while the other set of insulators terminates the second section. The wires of each section are looped together separately and one wire is used to loop the two sections together.

If these strainers are in accessible positions, the single wire loop from one section to the other can be used to isolate the distant portion of the fence when locating a fault. This method of isolating one section from another applies also to fences leading away from the main fence. Much time can be saved in locating a fault by this method of elimination, especially if reliable knife switches are fitted at the joins.

Method of Erecting Fence

The gateways should be planned and built first. Local knowledge will be invaluable in planning these, as the normal fencing on either side should be placed to absorb any buffeting caused by mobs of cattle being moved from paddock to paddock.

When the gate sections have been completed the angle posts should be

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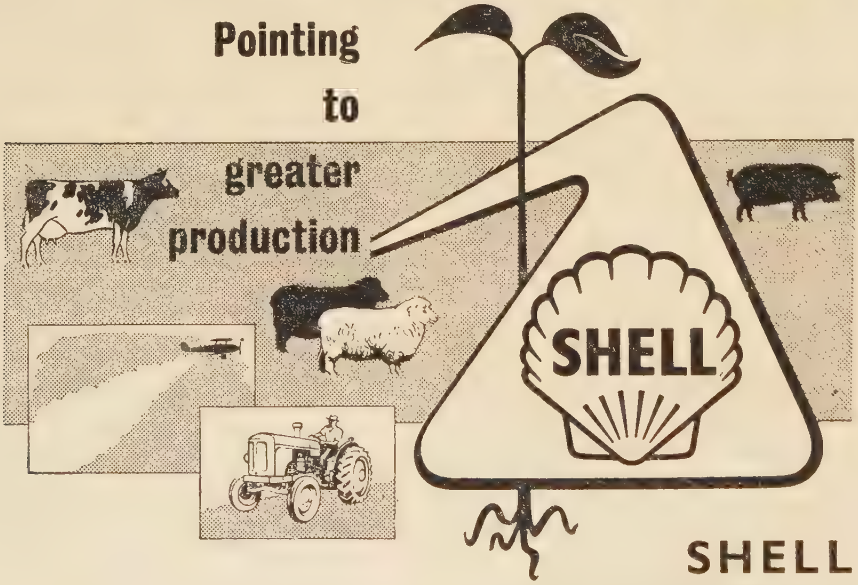

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placed in position and insulators fitted to them and also to the strainers.

The next job is to lay out the earth wire as a guide for lining up the iron standards, which should be driven (on rises) at intervals of about a chain for easy ground and ½ chain on rough country. The insulated chain assemblies can then be placed on the standards and the live wires pulled out one or more at a time, threaded through the chain links at the appropriate height and through the angle insulators, and finally attached at each end to shackle-type insulators fitted with galvanised bolts. It is advisable to fit a set of permanent strainers (preferably near a support) in the centre of each span for future tightening.

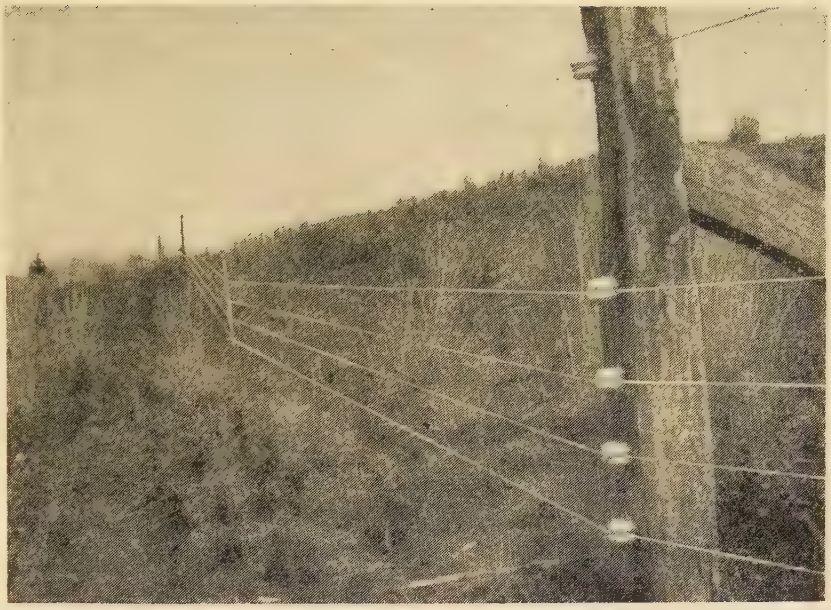
Insulated footed chain droppers may now be attached to all the wires by Hunter running clips to enable the fence to be pulled down into depressions so that the distance between the ground and the earth wire remains constant at about 5 in. When this work is completed the wires (especially the lower wires) should be gently strained. If the fence passes over soft ground, some form of plate will be needed to stop the standards from sinking when the wires are tightened. Since at any time slack wires can be pulled up with the permanent strainers, the initial strain should not be too firm.

All the electrical connections between the fence sections should next be completed and the controller connected. Before switching on, check the following:

- The earth wire should be continuous from one end of the fence to the other. It should be taken under gateways and across streams. At the far end of the fence the earth wire should be tied to the strainer. It must **not** be connected to the live wire to complete the circuit.
- Make sure that the earth wire on the fence is connected to the earthing terminals on the electric fence controller and on the wind charger, if one is used.
- Make sure that the earth wire is tied **below** the insulator on all footed droppers. If by chance the earth wire is tied above the insulator, the live wires and earth wire are short circuited through the chain. This fault is difficult to locate.

Maintenance

Charging batteries: As far as possible the electric fence controller should be operated at minimum pulse speed. Some controllers will continue to work satisfactorily for six weeks at 50 pulses per minute before discharging the battery, but 120 to 150 pulses per minute are needed to train sheep to the fence. When the battery becomes discharged completely it can be recharged with a garage-type trickle charger. Semi-dry cells are replaced with new cells when they become completely discharged. These cells should be used only with a fencing unit specially designed for them, as they may discharge quickly when used on ordinary controllers. When a wind charger is used the battery will normally remain fully charged, though failure can occur if many windless weeks pass by, an unusual occurrence in New Zealand.



Where grazing is lenient hand clearing or spraying may be necessary to keep vegetation from causing short circuits. It is important that sheep dogs should be able to jump through or over electric fences, and the gap below the top wire of this fence is wide enough for this.

Testing methods: A small neon tester is available for 5s. or 6s. which is quite suitable for testing an electric fence. This tester has two short test leads. When one test lead is placed on a metal standard and the other on a live wire the neon indicator will flash with each pulse of the controller. The flash is not very bright in daylight, but is sufficient to indicate when a fence is working. Alternatively, a blade of grass is quite useful for testing a fence; if you hold one end of the blade of grass and place the other end on a live wire, a very weak shock should be felt. If not, move your hand closer to the wire until a shock is felt. This method is more effective when the blade of grass is wet.

Radio interference: Any interference can usually be traced to a faulty insulator or an electrically faulty joint along the fencing wires or earthing system. A faulty joint is one which causes sparking across the joint as a result of oxidation. Quite a small spark can cause interference in nearby radio receivers, because the fencing wires act as a radio transmitting aerial. This fault can be overcome by tightening with pliers any loose joints along the fence in either the live wires or earth wire. If the controller is mounted on a stake, sparking may occur between the controller housing and the stake after prolonged exposure. This fault is apparent if the operator receives a shock when touching the controller housing. To overcome this trouble remove the controller and clean the mating faces of both the stake and controller.

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Acknowledgment

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V-548—A New Glasshouse Tomato for Release in 1959

By D. E. YEN, Crop Research Division, Otahuhu, and F. J. NEWHOOK, Plant Diseases Division, Auckland, both of Department of Scientific and Industrial Research

AT a meeting of the Vegetable Seeds Committee in December it was decided to release the tomato variety V-548 through the Government Approval Scheme for vegetable seeds. The evidence which has led up to this release was presented at the meeting, and is presented again here to give growers information from trials under experimental conditions and in commercial glasshouses.

Origin of V-548

SIX tomato lines were introduced by the Department of Scientific and Industrial Research from the Vineland Experiment Station, Ontario, Canada, because of their immunity to all known strains of leaf mould (*Cladosporium fulvum*) in Canada. It was thought that even if none of the lines proved suited to New Zealand conditions, valuable material would be introduced to begin breeding a local variety with immunity to leaf mould. However, in preliminary tests one of the resistant varieties, V-548, gave promise of being a suitable type for this country.

V-548 has in its parentage the hairy Peruvian tomato *Lycopersicon hirsutum*, from which its immunity is derived. So far no authenticated case of breakdown of this resistance has been recorded. Growers in this country are familiar with the cases of Improved Baystate and Vetomold in which resistance derived from *L. pimpinellifolium* rapidly broke down.

Resistance to Leaf Mould

In laboratory tests at Plant Diseases Division V-548 was subjected to stringent tests both with an Auckland collection of the leaf mould fungus and a collection which was representative of the glasshouse areas through New Zealand. No single plant tested could be scored as susceptible while Potentate in the same tests gave scores of 100 per cent infected.

In glasshouse trials where no leaf mould control was practised no leaf mould was detected on V-548 plants, while Potentate suffered severely, especially at the later stage of growth.

Trials in which a few rows of V-548 were planted in among Potentate in commercial houses showed similar results, especially when leaf mould control was stopped late in the season.

Comparison of Yields

To gain acceptance a new resistant variety must measure up to the standard variety in yield. Under experimental glasshouse conditions in the Auckland area V-548 has shown comparable yield results with Potentate. Table 1 gives comparisons of yields of the two varieties over three years' trials.

TABLE 1—COMPARISON OF YIELDS OF POTENTATE AND V-548 IN THREE YEARS' TRIALS

Trial location and year	Picking period	Yield per plant* Potentate lb	Yield per plant* V-548 lb	Statistical significance
Otahuhu, 1956	19/10/56-4/1/57	9.6	9.4	Non-significant
Otahuhu, 1957	3/10/57-20/12/57	9	9.7	Non-significant
Auckland, 1958	19/9/58-24/12/58	8.3	10.3	Significant
Levin, 1957	10/12/57-10/3/58	10.9	8.7	Significant

* 3 sq. ft. per plant

TABLE 2—COMPARISON OF EARLY YIELDS OF POTENTATE AND V-548 IN THREE YEARS' TRIALS

Trial location and year	Picking period	Yield per plant Potentate lb	Yield per plant V-548 lb	Statistical significance
Otahuhu, 1956	19/10/56-2/11/56	0.74	1.44	Significant
Otahuhu, 1957	3/10/57-29/10/57	0.66	1.12	Significant
Auckland, 1958	19/9/58-2/10/58	0.32	0.45	Significant
Levin, 1957	10/12/57-31/12/57	1.15	1.15	—

The first three trials were May plantings, and both varieties were subjected to the same irrigation and manurial treatments—hand watering and side-dress manurings in 1956 and the trickle system in 1957-58. All were replicated trials, records being taken on 72 plants of each variety.

The trial at the Levin Horticultural Research Station, Department of Agriculture, was planted on 30 August 1957.

Horticultural Instructors have reported the following yield information from commercial properties:

Hastings: On a 70-plant comparison V-548 yielded 10.4 lb per plant and Potentate 7 lb.

Hamilton: 36 plants of each variety were compared; V-548 yielded 1,224 tomatoes and Potentate 1,059.

Blenheim: 64 plants of each variety were compared; V-548 yielded 7 lb per plant and Potentate 7.4 lb.

Further information from growers' trials for the 1958 season is forthcoming, but all yield information available indicates that V-548 does approximate Potentate in yield, even where leaf mould has been reasonably well controlled in Potentate.

Early Yield of V-548

Earliness is of considerable importance in some indoor growing areas, and in trials under experimental conditions in the Auckland area V-548 has shown a small, but not insignificant advantage in this respect. Table 2 gives this information.

If early yields occurred in the trials on commercial properties, the difference between V-548 and Potentate was apparently not enough to record. Future observations of growers of V-548 should be interesting in this regard.

Blotchy Ripening

Blotchy ripening, a physiological condition which impairs fruit quality, has been the subject of considerable investigation in New Zealand. Figures of the incidence of the condition have been recorded in trials, and V-548, for which there were no claims for resistance to blotch, showed a surprisingly low incidence compared with Potentate. This was also recorded in Hastings in a growers' trial, and this result is included with the results of experimental trials in Table 3.

TABLE 3—INCIDENCE OF BLOTCHY RIPENING IN POTENTATE AND V-548

Trial location and year	Incidence of blotchy ripening (percentage of fruit harvested)	
	Potentate	V-548
Otahuhu, 1956 ..	4	1
Otahuhu, 1957 ..	6	0.5
Auckland, 1958 ..	12	0.3
Hastings, 1957 ..	14	1.4

Plant Characteristics of V-548

V-548 is a vigorous-growing plant and is generally conceded by growers and instructors who have seen it to be an easier plant to grow than is Potentate.

In unheated houses leaf formation is straight, in comparison with Potentate, whose leaf twist in colder months is an obstacle in the handling of plants.

In one Auckland growers' trial and in the Auckland experimental crop in 1958 frost damage was considerably less in V-548 than in Potentate in the same house.

The cultural aspects of V-548 have not yet been studied, but growers have said that though it is easy to grow, modifications of existing methods of watering, feeding, etc., may be desirable.

Experience in 1958 under unheated conditions has indicated that fruit-set percentage under low temperature could be superior in V-548. Where greenhouse temperatures were low rough fruit resulted in V-548, but Potentate in the same house often failed to set, despite use of fruit-setting agents.

Other Characters in V-548

Taste characteristics of V-548 seem to be similar to those of Potentate. A panel at the Crop Research Division's Vegetable Station at Otahuhu was unable to differentiate between the two varieties in a 1956 test.

No variety exhibits favourable characteristics on all counts, and it is considered that at this stage certain criticisms of V-548 should be aired, so that growers can watch for the characteristics concerned in relation to the localities, growing methods, and marketing requirements.

Size of Fruit

There is some evidence that V-548 fruit is somewhat larger than Potentate, though there is not general agreement on this in growers' and instructors' comments.

Shape of Fruit

Some growers have stated that V-548 is inclined to roughness, but it has **not** been established in direct comparisons in trials that it is worse than Potentate in this respect. Neither variety produces ideal-shaped tomatoes under all conditions. In the Auckland district 1958 was considered a "rough" year, and in the local trial approximately the same weight of rough fruit was picked from each of the two varieties. In terms of weight of fruit classed as rough V-548 gave 18 per cent compared with Potentate's 21 per cent.

In Hastings the growers' comment was that V-548 showed little rough fruit, "unlike Potentate".

Greenback

A higher incidence of greenback was reported by one grower. This has not been in evidence in any other trial.

Branching of V-548

There is a stronger tendency for plants of V-548 to produce two leading shoots, complicating training.

Further Selection

It is considered that V-548 could be improved further by selection, just as Potentate has been improved. Selection for double trussing could reduce fruit size, and this was initiated in 1957. In one glasshouse in Auckland out of 580 V-548 plants only 38 showed double trussing, while over 50 per cent of Government approved stock of Potentate showed this characteristic. Other characters which are to be selected for are good fruit shape and single leader plants. This selection work will be carried on by Crop Research Division in conjunction with the early stage of the approval scheme.

Release of V-548

The first release of seed, about 11 lb, has been made through the Horticultural Seedsmen's Association from seed grown by Crop Research Division in time for late autumn sowings. Future seed will be increased from a nucleus to be made available to the Seedsmen's Association for increase under the supervision of the Horticulture Division, Department of Agriculture.

The production of V-548 nucleus seed will differ from that in Potentate. Since a continual check of V-548's immunity to leaf mould is desirable, nucleus seed will be produced by Crop Research Division and Plant Diseases Division. All plants selected for nucleus seed production will be screened for leaf mould resistance.

The possibility of development of new races of the leaf mould organism capable of attacking V-548 cannot be wholly discounted, so that periodic checks on leaf mould races in the country will be made at Plant Diseases Division.

It is not intended to name V-548, as it is already widely known in New Zealand by its Vineland Station serial number.

Summary of Information

1. V-548 has shown immunity to leaf mould in all tests in New Zealand so far.

2. Yield of V-548 is comparable with that of disease-free Potentate. There are indications that V-548 can be slightly earlier in maturity.

3. V-548 has consistently shown a significantly lower percentage of blotchy ripening than has Potentate.

4. V-548 is a vigorous grower and easy to handle, with the limitation that there is often double branching. It appears to be slightly less susceptible to frost than is Potentate. There seems to be some cold resistance.

5. In common with Potentate, fruit size and shape may not be ideal under all conditions.

6. A small quantity of seed is to be released through the Horticultural Seedsmen's Association in time for autumn sowing in 1959.

Acknowledgment

To Dr E. A. Kerr, Chief Research Scientist, Vineland Station, Ontario Department of Agriculture, Canada, who provided the initial seed stocks for testing and forwarded permission for the release of V-548 in this country. Dr Kerr states that V-548 is not being released in Canada, but that V-546 (named Vinequeen), a similar but larger-fruited variety, has been released for leaf mould resistance.

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Winter Show Dates

*26, 27, 28, 29, 30 May, 1 and 2 June—Waikato Winter Show at Hamilton.
*28, 29, and 30 May, 1 and 2 June—Otago A. and P. at Dunedin.
*10, 11, 12, and 13 June—Taranaki A. and P. at New Plymouth.
11, 12, and 13 June—Te Kuiti and District Winter Show at Te Kuiti.
16, 17, 18, 19, and 20 June—Whangarei A. and P. Winter Exhibition at Whangarei.
26, 27, 28, and 29 August—Whakatane A. and P. at Whakatane.

* The Department of Agriculture exhibit will be staged at this show.

Wool Sales

11 and 13 May: Auckland.
18 May: Napier.
21 May: Wanganui.
25 May: Wellington.

June is a Quiet Month in the Home Garden

By A. G. KENNELLY,
Horticultural Instructor,
Department of Agriculture,
Dunedin

RECORDINGS taken over several years at meteorological stations in various parts of New Zealand show that soil temperatures at a depth of 4 in. at 9 a.m. are often below 50 degrees F. in June, July, and August. This is too low for good growth of practically all vegetables. Though temperatures are usually higher in the shallower layers of soil in specially well sited situations, particularly during the hotter parts of sunny days, the soil-temperature recordings indicate that it is generally not advisable to do much sowing or planting in June. Though ground temperatures at a depth of 4 in. remain low during July and August, too, prospects of success with sowings made in these months are greater because of increased duration and intensity of sunshine and because the period for which young plants are subjected to low temperatures is shorter.

[*Sparrow*

June, when so much ground is vacant or being cleared of crops, is a good time to apply lime.

JUNE, when the work of planting, sowing, and cultivating crops is greatly reduced, is usually a good time to attend to jobs such as cleaning, polishing, and sharpening garden tools, installing drains or improving drainage, making or renewing garden paths, repairing or building garden furniture, trellises, frames, and fences, and cleaning and repairing glasshouses. The insides of glasshouses can be sprayed with formalin at 3⅓ fl. oz. to 1 gallon of water, particularly where leaf or stem disease has been prevalent.

Sowing and Planting

Sow

In well drained soil: Broad beans, spinach.

In the milder districts or in a frame or sheltered situation elsewhere: Cabbage, cauliflower, lettuce—for late-spring use.

Plant

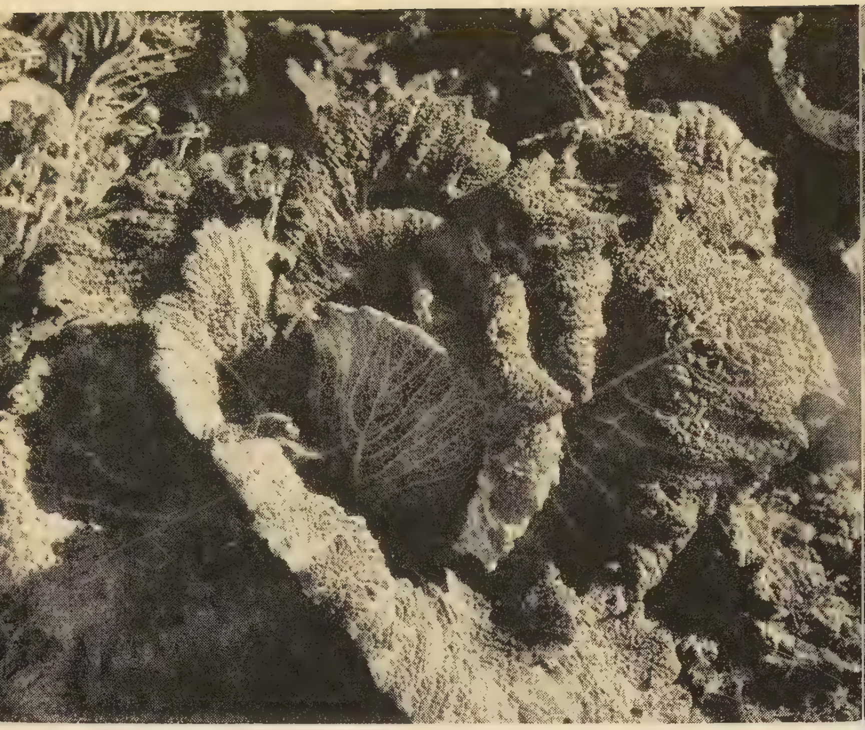
Cabbages and cauliflowers—for spring use. Shallots, rhubarb, asparagus crowns—in well drained situations.

So that they will be ready for use when needed sprayers and spraying equipment should be checked over, cleaned and oiled, and, if necessary, washers renewed or soaked in neat's-foot oil to keep them pliable. Most hardware firms specialising in gardening equipment have or can press washers to fit garden sprayers if the originals have failed.

Seed catalogues can be ordered if the garden is a large one and considerable quantities of seed are usually bought, or at least consideration can be given to the merits of different varieties and decisions made on cropping plans.

Celery and leeks should receive their final earthing up if this work has not yet been done. The digging of potatoes should be completed without delay, particularly in soils that tend to lie wet or where late blight has been troublesome, as the tops should by now have been dead for

Important Vegetables in the



Savoy cabbage.

Photographs on this and opposite page by Green and Hahn.

Brussels sprouts.

the necessary 10 days to a fortnight in most districts and nothing is to be gained by deferring digging.

Digging Vacant Ground

Land from which crops have been harvested recently and which is to be used within the next month or so should be dug over to improve drainage and to assist the rotting of root fibres and similar residues and to expose insect pests and their eggs to birds and other destructive agencies. Green crops that are in the flowering stage or approaching it or are growing on land soon to be used for a vegetable crop should be turned in to rot down. If digging is left until later, the weather may make it more difficult.

Liming may be advisable. June and July are generally suitable months for applying lime, as in many gardens a considerable area is then bare of crops and winter and spring rains can usually be relied on to wash the lime down through the soil.

The well planned home garden should show to advantage in June and though the kinds of vegetables available may vary from district to district, root crops should be available in variety as should some of the winter greens, such as winter cauliflower, savoy or winter cabbage, curly kale, and brussels sprouts. There should also be celery, silver beet, spinach, winter rhubarb, leeks, and lettuce, and, in store, potatoes, onions, pumpkins, squash, and perhaps kumaras and Jerusalem artichokes.

Unless conditions are specially favourable, sowing and planting must proceed only with extreme caution. In most areas growth at this time of year is so slow that there is considerable risk that before growth is properly started seed or young plants will fall victim to the many insects and parasitic fungi which inhabit the garden.

Sowing and Planting

Broad beans: Though it is rather late, a sowing of broad beans made now will provide a welcome addition to the limited range of vegetables available in early summer. They should be sown 2 to 3 in. deep in a double row with the beans zig-zagged 4 in. apart in rows 3 ft apart. A quart of beans will sow 100 ft of row. The broad bean is a hardy vegetable and will withstand quite severe weather.

Cauliflowers, cabbages, and lettuces: In districts which have a mild winter, spring cauliflowers, such as the All Seasons variety, early round-head cabbage, such as Golden Acre, and lettuce, such as Neapolitan Winter, and Triumph, and Imperial 615, may be sown or planted. Elsewhere it is better to delay sowing or planting or sow in a frame or in a warm, sheltered situation. Plants from these sowings will be ready for setting out early in spring.

Spinach, peas, radishes, and spring onions: If the ground is well drained and the soil not too heavy and wet, sowings of spinach, radishes, and spring onions may still be made. Peas of an early dwarf variety such as William Massey or Blue Bantam sown during the early part of June will add variety to spring menus, but these crops should not be sown unless soil conditions are favourable; if there is doubt, it is better to wait until July or August.

Established Crops

Standing crops such as broccoli or winter cauliflower, savoy cabbage, and

Broccoli or winter cauliflower.

Curly kale.

Oxheart, pointed-type, or "spring" cabbage.

the earlier-planted spring cabbage should be kept weed free. Where soil temperatures are favourable for growth spring cabbages or cauliflowers which are making insufficient progress usually benefit from organic liquid manure or liquid manure made by adding about 1 oz of either sulphate of ammonia or nitrate of soda to 4 gallons of water.

The fronds of asparagus will now have lost their green colour and should be cut down. They can be cut off a couple of inches from the ground and removed before manure is applied.

If it is intended to plant a new bed, a start is best made in June. As asparagus beds last for many years, time and effort expended in their proper preparation will be amply repaid. The bed can be 3 ft 6 in. to 4 ft wide and the ground should be deeply trenched, perennial weeds removed, and, if necessary, the site drained. Organic manure should then be incorporated in the soil.

Broccoli

Broccoli should be watched for signs of approaching maturity. Apart from their hardiness and the longer period required for them to mature, the principal difference between this class of cauliflower and the summer cauliflower is that the broccoli is partially or wholly self-protecting. The outer leaves are sufficiently stout and long to curve over and so protect the curd from frost and, to some extent, rain and light. However, they should be watched as the curd develops to ensure that the outer leaves are giving the necessary protection. Should the curd be exposed, an inner leaf or two can be bent over or broken off to cover the curd.

Leeks

The leek is among the most easily grown of vegetables, as it is little

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troubled by either insect pests or disease. Most crops should now be reaching full growth. Leeks "stand" well, and if the supply of winter greens is likely to become exhausted before the spring greens are ready, a few leeks left now may be useful later.

Potatoes

Potatoes should be sorted over from time to time to pick out any which are going rotten. In districts where specially early potatoes can be grown tubers of a suitable variety should now be placed on a floor or in boxes in a light, airy, frost-proof shed or outhouse to enable the skins to become green and to allow short, strong shoots, which are important for early production, to develop.

Where the tuber moth is troublesome seed tubers, particularly the eyes or any scars or clearly marked depressions on them, should be dusted with DDT. Potatoes stored in sheds or outbuildings in districts subject to heavy frost should be protected from excessively low temperatures. If the building is open or if there are cracks in the walls, so that air at freezing temperatures can enter and freeze the potatoes, the yield from tubers to be used for seed may be significantly reduced.

Rhubarb

The rhubarb bed should be weeded, forked over, and manured. Rhubarb is a gross feeder and responds well to liberal dressings of organic manure.

June is one of the best months to replant or extend a rhubarb bed. The present roots should be dug out with a strong, sharp spade and placed in a shady site where they are not exposed to drying winds. They may be left until the development or shooting of the buds indicates planting time. Each good bud together with a good piece of root adhering to it cut from the clump should develop into a plant if set out. Preparation of the site of the intended bed may be started. If it has already been dug over, it can be cleaned of weeds, manured, and, if necessary, drained.

Tomatoes

Except in a few specially favoured districts all outdoor tomatoes should have been harvested and the plants dug out and burnt. Recently harvested fruit which is mature but not yet coloured is best ripened by being packed in a case or box and placed in a warm room or shed. The widespread practice of exposing such fruit to the sun on window ledges or similar places often results in a high proportion of shrivelled or collapsed fruit. Only sound, reasonably mature fruit should be packed, as fungous growths develop and spread quickly from injured fruit in storage.

◆

Large rhubarb crowns can be → divided and smaller sections replanted in June.

Green and Hahn

Reducing Dairy Farm Fencing Costs

By G. J. BATTEN,
Instructor in Agriculture,
Department of Agriculture,
Thames

THE reduction of dairy farmers' income has focused attention on farm costs. Fencing, though not normally a large annual cost, is one which can be reduced by judicious use of wire and posts. On nearly every dairy farm a three-wire fence is sufficient to control cows and calves, yet frequently new fences are constructed with five and sometimes six wires. When each wire costs 3s. to 3s. 6d. per chain the use of a three-wire fence instead of a five-wire one can considerably reduce fencing costs. Where cows alone are run a two-wire fence is sufficient.

THE ideal height for the top wire of a three-wire fence is 3 ft., with the bottom wire 15 to 18 in. above the ground. For a two-wire fence the top wire should be 2 ft. 9 in. from the ground.

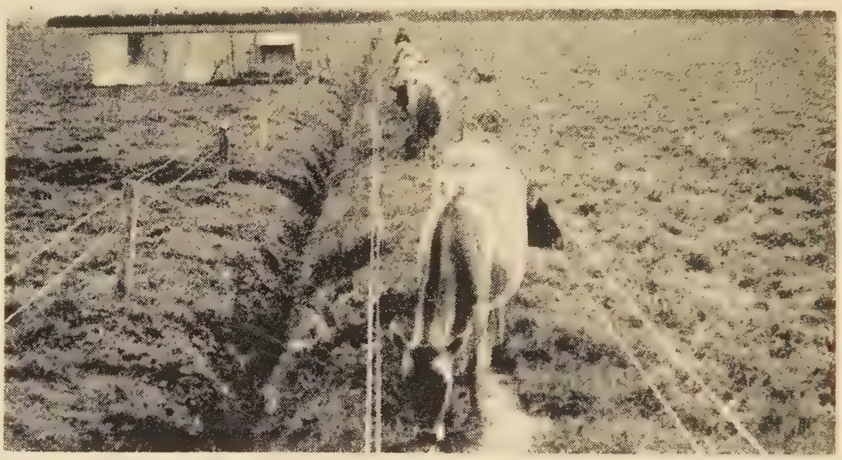
The number of posts, standards, and battens used is largely a matter of individual experience, and no definite recommendations can be made. Two posts and two standards per chain are usually sufficient, though the number of posts or standards per chain can be varied without much variation in costs.

Concrete posts should always be used where possible. Their only disadvantages, when compared with wooden posts, are excessive weight and a smaller bearing surface. These are emphasised on peat and wet land.

The use of electrified wires can further reduce the capital invested in fencing, as fences of two wires with an electrified top wire are cow proof. Electrified single wires are sufficient for the herd, but when calves are rotationally grazed ahead of the cows two wires are needed. The mains-operated type of electric fence unit contributes to simplicity, and there is no reason why a farm should not be completely subdivided with electric fences. The whole farm need not be electrified at one time, as circuits can be arranged which supply only the fences controlling the cows during the day's grazing.

Expenses on posts and standards can be reduced, too, when electrified wires are used. One post per chain of the cheaper, lighter type is sufficient with one or two intermediaries.

This multi-wire fence, costing £3 15s. per chain, is not necessary to control dairy cows.



A two-wire fence, costing £1 15s. per chain, will control cows even on a race.

An electrified single-wire fence will control rotationally grazed cows at a cost of 15s. per chain.

Farm Dogs Could be Trained in Food Refusal to Aid Hydatids Eradication

By S. F. RILEY,
Sergeant-in-Charge, Police Dog Section, Police Department

FOOD refusal is the name given to a type of training for dogs under which the animal is conditioned to refuse all food except that offered to it by a certain person or accompanied by a certain command known to the dog, or given to the dog in a certain place. A worthwhile contribution toward combating hydatids could be attained by teaching dogs, through food refusal lessons, to leave carcasses of sheep alone when they come across them and so to a certain extent preventing the picking up and passing on of this disease, which is so ready to find a host among humans, especially children. An additional advantage is that dogs so trained will not poison themselves by feeding on poison baits or poisoned rabbits when large-scale rabbit destruction is being carried out.

FOOD refusal is very important for police dogs, and there seems no reason why it cannot be taught to an intelligent sheep dog. The groundwork of all police dog work is obedience, and food refusal is taught toward the end of this stage of training. While a young sheep dog is being trained this extra exercise could be incorporated without interference to its main training.

If possible, training should begin when the dog is young and before it becomes set in its ways. The experienced police handler begins training when a dog is about 5 months old. It is far easier to train a young dog in good habits than to break an old dog of bad ones.

The handler in taking over a young dog immediately conforms to a routine and the young dog quickly learns to realise when it is free to romp and attend to its needs and when it is under discipline. Quite a time before it comes to the stage when it will be introduced to food refusal a pattern of feeding is laid down and becomes habit.

Our young dog is fed once a day and only by its handler, using a special command, always if possible in the same place and at the same time and with the same feed bowl, which must be removed, with any left-over scraps, when the dog has finished. The dog is not allowed to drink until commanded to do so and he is watered once a day to train him against leaving his work, such as when on a "track", to go to water. Under exceptional circumstances such as hard work on extremely hot days he may be taken to water and commanded to drink at a time other than that prescribed by his routine training.

For a sheep dog the system described could be adapted so that the dog is conditioned to feed only on command or at its kennels and above all never to feed on carcasses or refuse.

In training a dog a few trainers commonly administer punishment or admonishment too late after a fault. For example, a trainer calls his dog to return, but the dog disregards the order and plays truant, though eventually returns to the trainer after repeated calls; the trainer is exasperated and at once administers some form of punishment. The dog nearly always associates punishment with the last thing it did, which in this case was to return to the trainer, and its confusion can be imagined. Correction must be immediate and at the beginning of the offence. In this case it would be better to commend the later correct decision of the dog to return than to punish the prior fault of playing truant.

Training

A dog is a scavenger by instinct and will seek out the most revolting refuse, including all kinds of excrement and putrid meat; he will even roll on it and enjoy doing so, and he must be prevented from both actions. The strictest discipline will be necessary to turn the satisfaction of eating into something that will be disagreeable except at the appointed time and place.

The dog must be taught to refuse food on the ground, offered or thrown to him by a stranger, when he is on the lead, running free or away from his trainer, or in his kennel, or thrown to him in a stranger's house. A dog can be taught that eating in a certain situation, as in a room or a paddock, is associated with pain or discomfort and consequently it will avoid eating there. The trainer must be prepared to keep the dog constantly in view in early training so that he is able to intervene when the dog seems to be about to pick up food or is about to roll on it.

A dog is activated largely by his sense of smell; his nose is in constant use, and a preliminary warning of a dog's intentions in regard to potential food can be gained by a trainer who has him under observation. He will sniff the ground occasionally, often while moving, but at times he will stop and investigate a spot; this could be the moment he is likely to commit the forbidden act or to use the spot for urination. If the former, the trainer can be ready with the correction. This is difficult while the dog is running free, as the trainer is often not in a position to apply the correct and strict compulsion necessary the moment the undesirable act occurs; strict discipline after the act is no use.

How Food Refusal is Taught

In the first stage the police dog is taught normal obedience such as to follow at heel, to come when called, and to sit down and stay. He is then taught while on the lead to refuse food offered by other people.

The food is offered by hand by a helper and should the dog attempt to sniff or take it, he is given a smart tap across the nose by the person offering it. This is accompanied by a harsh-voiced "a-ah!" or similar noise by the trainer and the food is offered several times. The dog is then left in the down position and the trainer retires out of sight of the dog, but keeps it under observation, and the exercise is repeated with the helper walking by and casually dropping food to the dog. It is important that the helper should not retrieve the food from the dog: The trainer should remove the dog from where the offered food is lying to another place. It is also important that the trainer should not give any food to the dog as a reward after the exercise, and from now on the trainer should be the only one to administer correction.

In the next stages food such as fish, meat, carcasses of small animals and birds, and anything that is likely to interest the dog can be placed about in a paddock beforehand on the route the trainer is likely to take. The position of the objects and the paddock should be changed from time to time. The exercises should be repeated as often as possible and methodically to prevent the dog forgetting the dis-

TEACHING DOGS FOOD REFUSAL . . .

agreeable aspects of it. It is useless to give a dog, say, half an hour's training today and allow a few days to go before renewing it, when he will have forgotten. Some training each day is advisable.

If the objects are left for some time, they will offer greater temptation to the dog, for they will become putrid. Temptation should be placed in the dog's way and he should be deliberately provoked into performing the undesirable act to ensure his being broken of it as early as possible in his training. A piece of chain, the lead, or a short, blunt stick can be carried and thrown at the dog at the right moment, accompanied by a stern reprimand.

The writer knew a gamekeeper on an estate who quickly taught the owner's dogs not to lift their legs against some rare shrubs. He used to carry a catapult and some acorns. A well directed acorn striking a dog from the rear as it was about to urinate quickly checked it, and the dog never knew from whence the correction came. The dogs soon learnt to respect the trees on that part of the estate and there is no doubt that this method could be adapted to food refusal and could be quite handy when the dog is at liberty.

It is a good idea to train the animal to refuse food from the trainer when he tempts his dog and to receive food only at the usual place and from the usual dish and when given the command. This command or sound is important, as it enables the dog to be fed by his trainer when away from home.

Food should be offered to the dog or left under all sorts of conditions and in various places; if he shows interest, he must be given the appropriate correction immediately. Food can be thrown or left at different times by both helpers and trainer while the dog is in its kennel or in the house and the trainer should keep the dog under observation without his suspecting it and be ready to apply immediate correction if he shows interest.

Training must be varied in every way, in food as well as times and conditions. Even when the dog is considered fully trained he should receive a refresher lesson from time to time.

Radio Broadcasts for Farmers

RADIO broadcasts for farmers will be given during June as follows:

1YA Auckland, 7.45 p.m.

4 June—"Meat Inspection, Ancient and Modern", by G. Payne, Deputy Supervising Meat Inspector, Westfield.

11 June—"Feeding Stock in Winter", by G. B. Haddow, Instructor in Agriculture, Department of Agriculture, Auckland.

18 June—"Brooder Management", by J. Jamieson, Poultry Instructor, Department of Agriculture, Auckland.

25 June—"Buttercup Control", by G. J. Batten, Instructor in Agriculture, Department of Agriculture, Thames.

1YZ Rotorua, 7.15 p.m.

3 June—Young Farmers' Clubs, by Matamata Y.F.C. district committee.

17 June—"Training the Future Farmer", by A. V. Allo, Instructor in Agriculture, Department of Agriculture, Tauranga.

1XH Hamilton, 12.33 p.m.

8 June—"Farm Safety", by D. F. J. Pilkington, Y.F.C. farm safety officer.

15 June—"Preparations for Lambing", by G. R. Mackintosh, Livestock Instructor, Department of Agriculture, Hamilton.

22 June—"Cream Separators and Maintenance", by L. E. Downs, Special Inspector, Department of Agriculture, Hamilton.

29 June—"Meat and Wool Matters", by A. W. Moore, Federated Farmers.

2XA Wanganui, 8 p.m.

4 June—"For the Country Woman", by Mary MacDonald.

11 June—"Farming News".

18 June—"Some Factors that Influence Wool Growth and Value", by P. C. Marshall, Sheep and Wool Instructor, Department of Agriculture, Wanganui.

25 June—"Theory of Incubation", by B. J. Russell, Poultry Instructor, Department of Agriculture, Wanganui.

2ZA Palmerston North, 12.33 p.m.

8 June—"Plastics in Horticulture", by G. N. Paulin, Horticultural Instructor, Department of Agriculture, Palmerston North.

22 June "Poultry", by M. E. White, Poultry Instructor, Department of Agriculture, Levin

3YA Christchurch, 12.20 p.m.

15 June Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Instructor in Agriculture, Department of Agriculture, Rangiora.

Regular Sessions

1YA Auckland, Mondays at 12.36 p.m. ("Country Journal", including "Report from Ruakura"), Tuesdays, Wednesdays, Thursdays, and Fridays at 7.45 p.m. ("Country Journal"), Thursdays at 12.33 p.m. ("News for the Farmer").

1XN Whangarei, Mondays at 8 p.m. ("Northland Stock Market Report" followed by "Farming for Profit"), Wednesdays at 8 p.m. ("Farming for Profit"), and Fridays at 12.33 p.m. ("Farm News").

1XH Hamilton, Mondays at 12.36 p.m. ("For the Farmer", excluding first Monday in month and public holidays), Wednesdays at 12.33 p.m. ("Report from Ruakura").

1YZ Rotorua, Wednesdays at 7 p.m. ("Bay of Plenty Journal"), Thursdays, 12.33 p.m. ("News for the Farmer").

2YZ Napier, Tuesdays at 7.10 p.m. ("The Hawke's Bay Farmer"), and Thursdays at 12.33 p.m. ("News for the Farmer").

2XG Gisborne, Tuesdays at 8 p.m. ("Farm Session").

2XP New Plymouth, Fridays at 8 p.m. ("Farm Session").

2XA Wanganui, Mondays at 8 p.m. ("For the Man on the Land"), Tuesdays at 8 p.m. ("Farm Supplement"), and Thursdays at 8 p.m. ("Farm Topics").

2XB Masterton, Fridays at 6.45 p.m. ("Farm Session").

2XN Nelson. Thursdays at 8 p.m. ("Nelson Farm Topics").

2ZA Palmerston North, Mondays at 12.36 p.m. ("Country Digest") and Fridays at 8.30 p.m. ("Country Digest", including Feilding stock market report).

2YA Wellington, Mondays, Tuesdays, and Fridays at 7.10 p.m. ("Farm Session"), Thursdays at 12.33 p.m. ("News for the Farmer").

3YA Christchurch, Mondays at 12.20 p.m. ("Country Session"), Thursdays at 12.33 p.m. ("News for the Farmer") and 7.10 p.m. ("Home Paddock").

3XC Timaru, Wednesdays at 8 p.m. ("Farmers' Weekly News Service") and Saturdays at 10.30 a.m. ("Country Mailbag").

3YZ Greymouth, Mondays at 12.36 p.m. ("Farm Session") and Thursdays at 12.33 p.m. ("News for the Farmer").

4YA Dunedin, Mondays at 12.36 p.m., Tuesdays at 12.33 p.m., Wednesdays at 12.33 p.m., and Thursdays at 12.33 p.m. ("News for the Farmer").

4YZ Invercargill, Mondays at 12.36 p.m., Tuesdays at 12.33 p.m., Wednesdays at 12.33 p.m., and Thursdays at 12.33 p.m. ("News for the Farmer").

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[*National Publicity*

Topdressing for Some Southland Soils

By J. R. THOMSON,
formerly Instructor in Agriculture, Department of Agriculture,
Invercargill

THE Extension Division of the Department of Agriculture has carried out a large number of trials to determine the fertiliser requirements of soils throughout the country. In this article the results of trials which have been laid down on the various soils of the south-east portion of the Southland Land District are reviewed. There are a number of different soil types within this area, but the biggest portion of the intensive farming occurs on a series of soils known as the yellow brown earths. There are also extensive areas of peaty soils and smaller areas of alluvial and sandy soils.

THE area covered by the article is shown in the map on page 499. From Invercargill east to the valley of the Mataura River stretches gently rolling land, which is bordered on the south by an extensive area of peat soils and on the north by the Hokonui Hills. To the east is a belt of foothills which extends from the Mataura River to the South Otago coast. Apart from the peat soils to the south, the area is devoted to fat lamb farming, with dairying occupying an important, but steadily decreasing, part in some of the wetter, more fertile areas. Cattle fattening plays a minor role, while store sheep are raised only on the least developed areas.

Apart from the provision of winter feed in the form of swedes, turnips, chou moellier, and green feeds, very little cropping is undertaken. The soils are capable, with adequate fertilising, of maintaining good pasture swards, and all the improved species of grasses and clovers will establish and thrive. Carrying capacities range from two to six ewes per acre, and on much of the area the potential carrying capacity has not yet been reached.

Very little development has been carried out on the peat areas, and though it has been shown that they too are capable of being intensively farmed, it is likely to be many years before they are developed to such a stage.

Soil Types

As mentioned before, by far the biggest proportion of the intensively farmed area is on the soil type series known as yellow brown earths. The parent material in the formation of these soils is greywacke, and in their original state they supported a vegetation of either red tussock or a mixed podocarp and broad-leaf forest. In their natural form they are generally of low fertility, but, as has been shown by Southland farmers, are capable of considerable development.

The following is a description of the various soil types shown on the map on page 499.

1758

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Group 1: This group, which is mainly of the soil type known as Kaiwera yellow brown earth, covers the hill country stretching eastward from the Mataura River valley. The natural vegetation was a red tussock association, with small patches of swamp and peat, and altitude ranges from 100 to 1,500 ft above sea level. Drainage is generally moderate to good. The average carrying capacity is about two sheep per acre, with a potential of up to four sheep, and fat lamb raising is the principal farming pursuit.

Within this group there are also small areas of Owaka and Chaslands yellow brown earths. The Owaka soils differ in the natural vegetative cover, which is a black pine and totara forest with a thick layer of broad-leaf species below. Parts of this bush have been cleared for grazing cattle and store sheep. Chaslands soils are at present little farmed and are not extensive in area or importance.

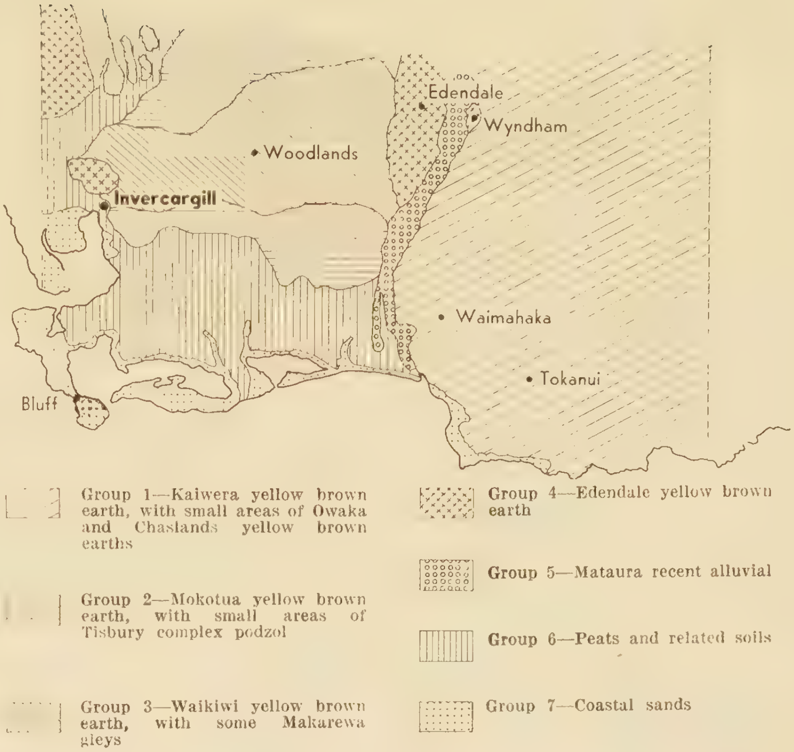
Group 2: The main soil type within this group is the Mokotua yellow brown earth, with small areas of the Tisbury complex podzol. The natural vegetation in both cases was a mixed podocarp forest. The establishment of pastures out of bush is initially only partly successful, and there is a tendency for the pastures to revert to poorer-type grasses. With a build-up in fertility, however, good swards will hold successfully and carry up to four sheep or more per acre. Farming is almost entirely devoted to lamb fattening.

Group 3: Here the main soil type is that known as the Waikiwi yellow brown earth. The natural vegetation was mostly red tussock, with small patches of bush. Almost the entire area is now under sown pasture, with a carrying capacity of up to five sheep per acre. Fat lamb raising is predominant, but there is a small amount of dairying also. Many narrow swampy streams dissect the terraces, and here the soil type is usually that known as Makarewa gley.

Group 4: The Edendale yellow brown earth has also been developed from red tussock with small patches of bush. Drainage is fairly good and the soil is not dissected to nearly the same extent as are the other yellow brown earths. Natural fertility is moderately high and the area is devoted to intensive dairying and fat lamb raising, with carrying capacities of up to six to seven ewes or their equivalents per acre.

Group 5: Along the Mataura River is a band of rich alluvial soil known as Mataura recent alluvial. Parts of this soil type are poorly drained and are more suited to dairying; on the better-drained parts lambs are fattened. The lower reaches of this series are subject to periodic flooding.

TOPDRESSING SOUTHLAND SOILS


Edendale
Wyndham
Woodlands
Invercargill
Waimahaka
Tokanui
Bluff
Group 1—Kaiwera yellow brown earth, with small areas of Owaka and Chaslands yellow brown earths
Group 2—Mokotua yellow brown earth, with small areas of Tisbury complex podzol
Group 3—Waikiwi yellow brown earth, with some Makarewa gleys
Group 4—Edendale yellow brown earth
Group 5—Mataura recent alluvial
Group 6—Peats and related soils
Group 7—Coastal sands

Group 6: This group consists mainly of peats and related soils. Natural drainage is poor and most of the area is still carrying a vegetation of rushes, moss, and manuka. It can be developed to pasture, but the costs of development are high and the provision of adequate drainage poses many difficulties.

Group 7: The coastal dune soils are predominantly sandhills and flats occupying a narrow strip round the coastline. They are largely undeveloped and of little importance agriculturally.

Fertiliser Needs

Over the years a considerable store of knowledge has been accumulated, through trial work and the Department's advisory soil-testing service, on the fertiliser requirements of these soil types.

Lime

Lime has played an important part in the development of first-class pastures in Southland. It is not the purpose of this article to discuss the roles which lime plays in the soil. Sufficient to state that they are many and varied. However, there is a limit to the amount of lime which can be usefully applied, and too much, besides having the possible effect of tying up other elements, can only be described as an economic waste.

The pH (or level of acidity) of the yellow brown earths in their virgin state is usually within the range of 5 to 5.4. The optimum level for pasture growth is considered to be pH 6.2 to 6.4, and to raise the pH level to this figure from its natural status requires a dressing of 3 to 4 tons of carbonate of lime over three to four years. It has been estimated that the loss of lime from the soil is about 5 cwt per year, mainly through leaching. Therefore, once the lime has been built up to the optimum level maintenance dressings of ½ ton every two years will be sufficient to keep acidity at the level desirable for good pasture growth.

The pH levels of the virgin peat soils are much lower, and consequently heavier dressings are required initially to raise the levels. One of the most acid tests ever recorded, a pH reading of 3.7, came from this peat country.

Phosphate

As in most parts of New Zealand the phosphate status of all soils is very low in the original state. To build up this level liberal dressings of either reverted or serpentine superphosphate are recommended with all crops and at the sowing down of the pasture. Dressings of up to 4 cwt per acre are warranted at this stage. It has been conclusively shown that once the area is in pasture annual dressings of phosphates are necessary to obtain maximum grass production. The amount to be applied each year will depend somewhat on the carrying capacity, from 2 cwt per acre annually being

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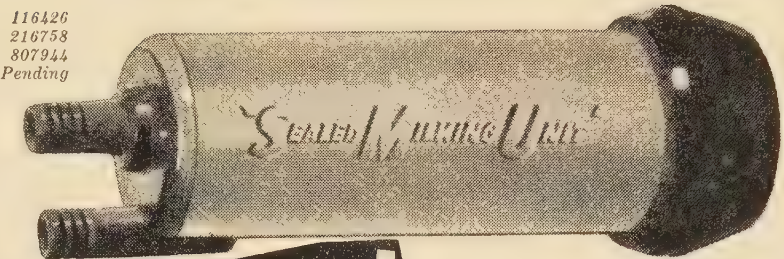

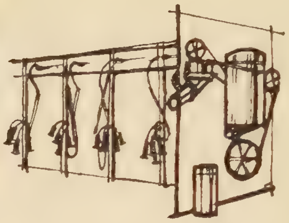

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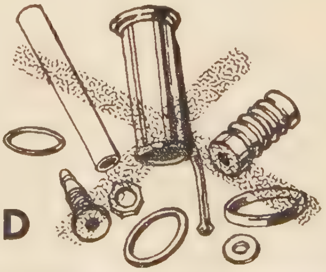

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applied on the less intensively stocked areas to up to 3 cwt annually on pasture carrying five or more ewes per acre. Generally autumn topdressing is recommended.

All work has shown that the type of phosphate which will give the best boost to grass growth is superphosphate, reverted superphosphate, or serpentine superphosphate. Basic slag has not proved superior to superphosphate to increase grass growth, and trials have shown that responses from slag do not last any longer than those from superphosphate. Unit for unit, the cost of slag is greater than that of superphosphate, so that its use can be considered justifiable only where the farmer feels that it has a beneficial effect on stock thrift. This point has not been studied on Southland soils, and though it has often been stated that stock do better on pasture which has been topdressed with slag, it has certainly never been proved scientifically.

Responses from other forms of phosphate, particularly rock phosphates, are inferior and their use cannot be recommended.

Potash

It has been known for a long time that the Edendale yellow brown earth is deficient in potash, and some quite remarkable responses have been obtained from the use of this fertiliser on these soils. On the other yellow brown earths, however, the position is not yet so clear. The potash levels tend to vary considerably from farm to farm and also from paddock to paddock. Indications are that the deficient areas are increasing and that it will only be a matter of time before all the yellow brown earths are as deficient as the Edendale soils.

It seems that initially there was a reasonable reserve of potash in these soils, but as farming has become more intensified these reserves have gradually been depleted. On the podzols and peats, too, potash levels are low. Here, however, potash responses will not generally be obtained until the fertility has been built up by adequate lime and phosphates.

The knowledge of the potash requirements of all these soils is by no means complete. It is known that to rectify deficiencies up to 1 cwt or more of potash is needed initially, the rates depending on the level of the deficiency. However, there is very little knowledge yet of how frequently potash must be applied after this initial dressing to maintain adequate levels. Trials have been laid down in an attempt to investigate this point, but it is too early yet to draw any conclusions from them. Observation suggests that on the Edendale yellow brown earth annual potash dressings of ½ to 1 cwt may be necessary, but on the other soils such frequent dressings are probably not yet essential.

Potash fertilisers are expensive and they should not be used indiscriminately. If they are required, however, they will repay their cost, and it may only be a matter of time before all intensively farmed areas will be using potash as a regular topdressing.

Nitrogen

The clovers in the pasture should provide all the nitrogen required for pasture growth, and provided the clovers are growing vigorously, the use of artificial nitrogen as a general topdressing is not recommended. It can, however, be a valuable fertiliser in providing out-of-season growth.

Trace Elements

A large number of trials have been laid down to investigate the effect of various trace elements on these soils. Very few have been shown to be necessary, and of these most have only a limited use.

Cobalt

Deficiencies of cobalt are widespread and vary from acute to marginal. Though not necessary for grass growth, this element is essential for stock thrift, and its use is recommended on all soil types. As cobalt is required by young stock from weaning until winter, and as applied cobalt remains available in the soil for only a relatively short period, it should be applied in late spring, preferably in October or November. It can be applied with superphosphate as a spring topdressing. Excellent results have also been obtained by spraying a cobalt solution on pastures. In all cases the recommended rate is 5 oz. per acre of cobalt sulphate.

Molybdenum

Molybdenum has only a very restricted use on these soils. Some responses have been obtained on the Kaiwera yellow brown earths, but only where no lime has been applied. Where heavy liming has been carried out no results will be obtained from molybdenum. It is not a substitute for lime, and so its use is recommended only on country which because of its topography cannot easily be limed. The recommended rate is 2½ oz per acre, applied every three or 4 years. On no account should it be used on peat soils, because molybdenum is likely to induce a copper deficiency, and peats are low in available copper.

Copper

There is some evidence that copper topdressing is necessary on the peat soils and on the belt of coastal sands, but not on the yellow brown earths. No responses have been noted in pasture growth from its use, but there is likely to be a response in stock thrift. The rate of application suggested is 5 lb of bluestone per acre.

Boron

Boron levels are low on these soils, but boron appears to be necessary only for root crops such as turnips and swedes, and no responses have been obtained from it on pastures. For root crops recommended rates are 5 to 8 lb of borax if sown in the ridges, or 15 to 20 lb if broadcast before the crop is sown.

Other Elements

No evidence has yet shown that elements such as sulphur, magnesium, manganese, iron, or any of the other nutrients necessary for plant growth are deficient on these soils.

Use of DDT

There have been many instances throughout the area of sward deterioration which farmers have put down to a lack of some plant nutrient. In almost all cases this has been shown to be due not to lack of fertiliser in some form or other, but to the ravages of either the grass grub or the porina caterpillar. Heavy populations of both these insects are present in most of the soils discussed in this article. The porina caterpillar in particular is causing a lot of damage on the rolling to hilly country, and on exposed faces may cause the complete disappearance of pasture species.

Even where the damage from either of these pests is not particularly noticeable it is fairly certain that they are depleting the amount of pasture available for stock. The need for the regular use of DDT on all improved pasture cannot be stressed too strongly, and all farmers should make sure that pastures receive a dressing of 2 lb of 100 per cent DDT per acre every three years. The extra cost of this operation will be amply repaid.

Summary of Recommendations

1. Heavy, continuous liming is not necessary. Three to 4 tons will build up the level sufficiently, and a ½ ton every two years will maintain this level.

2. Two to 3 cwt of superphosphate per acre should be applied annually on sown grassland.

3. Potash is necessary on most of the soils, but particularly on the Edendale yellow brown earth.

4. Artificial nitrogen is of value only in providing out-of-season grass.

5. Cobalt is necessary for most soils. Copper may be beneficial on the peats and sands, but molybdenum has a very restricted use. Boron is necessary for root crops.

6. Other trace elements are not required.

7. DDT should be used to protect pastures from grass grub and porina caterpillar.

GRILLS for the Gourmet

FAVOURED by the epicure because of their fine flavour, grills are also popular with those who appreciate appetising food which can be quickly and easily prepared. As a method of cookery grilling is becoming increasingly used, possibly because most modern cookers are equipped with either a separate grilling compartment or suitable top-heating oven elements, and also because of the popular fashion for outdoor cooking on a barbecue.

GRILLING is a means of cooking by dry heat and is therefore suitable for only the choicest cuts of meat or for food which does not require moisture and long cooking to make it palatable. It may be done either over hot coals or under a gas flame or an electric element.

Pan Grilling

In pan grilling the food is cooked in a heavy frying pan which has been lightly greased with fat, the heat being transmitted to the food from the hot metal of the pan instead of directly as in grilling. This method is suitable for meat patties or for thinner cuts of meat such as are used for minute steaks. As fat collects in the pan it is poured off so that only a thin coating remains.

Infra-red Grilling

Many restaurants and some private homes speed up the grilling process by using infra-red grillers. As the food is cooked simultaneously by radiant heat from the plates and by infra-red rays, the time required is less than when radiant heat only is used.

Barbecue

Another form of griller is the barbecue. The term "barbecue" originally meant a framework for smoking or grilling a whole carcass, but is now used more broadly to cover out-of-doors cookery of meat, poultry, and other foods.

A barbecue consists basically of a grate to hold the fire with grids above to hold the food. It may take the form of an elaborately constructed fireplace of concrete, brick, or stone, a neat portable stand suitable for burning charcoal, or an ordinary kerosene tin with a hole cut out and set on a few bricks. As a smokeless flame is desirable, the fire should be started some time before grilling begins. Very little fuel is required, as the drippings from the meat help to keep the fire alight.

Though the cooking temperature of a barbecue fire cannot be regulated as accurately as on a gas or electric cooker, food cooked over a barbecue has a special flavour which adds to the attraction of outdoor cookery.

Grilling by Gas or Electricity

For perfect results in grilling by gas or electricity a few basic points should be remembered.

Though it was formerly thought that grilling should be done at a high temperature, it is now accepted that a moderately low temperature (350 degrees F) is better. The reasons are that meat will be more uniformly cooked throughout, it will be more tender and more attractive in appearance, and there will be less shrinkage. Also, it will require less attention during cooking and the smoking and spattering of fat will be considerably reduced.

If a brown, crisp exterior is required, a short initial period of cooking at a higher temperature can be given until the meat is seared and then the remainder of the cooking done at a reduced temperature. This searing process does not, however, seal in the juices, but merely crisps the surface of the meat.

In all cases the griller should be pre-heated beforehand and the food placed 2 to 3 in. from the source of heat.

As salt tends to draw the juices out of meat, it should be added after grilling instead of before. The accepted method is to grill one side, season the cooked side before turning, and to season the other side before the grill is served.

To prevent loss of juices grills should be turned with tongs or a spatula and not by being pierced with a fork.

Time for Grilling

The time required will depend on the thickness of the meat, the grilling temperature, and the distance the griller is placed from the source of heat. It will also depend on whether rare, medium, or well done meat is preferred. Rare and medium-done beef steaks are plump and juicy, and a well done steak tends to be shrunken and dry. On the other hand lamb or mutton chops are generally preferred either medium or well done, that is evenly browned on the outside and juicy and tender inside, but without the redness associated with underdone meat.

Approximate Times for Grilling Meat 1 to 1½ in. Thick

	Minutes
Underdone steak ..	8 to 10
Medium-done steak ..	10 to 12
Well done steak	12 to 15
Lamb or mutton chops	12 to 20
Kidneys	8 to 10
Bacon (thin)	4 to 5

Meats, Poultry, and Fish for Grilling

Steak (Beef)

Tender cuts of steak such as fillet, rump, sirloin, and porterhouse are suitable for grilling. The meat should not be too fresh and should be cut at least 1 in. thick. Pan grilling is more suitable for thin steaks, as they will not brown under direct heat in the short time required to cook them. As toughness of meat is associated with the amount of connective tissue present, all steaks, with the exception of fillet, will be improved by beating with a spiked meat hammer or the edge of a saucer. Treatment before cooking with one of the special "meat tenderisers" will also make steak more tender. These tenderisers usually contain dried papaya juice, which acts on the connective tissue and softens it.

Chops (Lamb or Mutton)

Loin chops are most generally used for grilling, but chump chops are also suitable. Excess fat should be trimmed off and the outer edge of the remaining fat cut at intervals to prevent the chop curling during cooking. The bone may be removed and the chop neatly shaped and secured into position with a small skewer.

By ELEANOR COUSTON,
Home Science Instructor,
Department of Agriculture,
Christchurch

Marinade: To improve the flavour and also to increase their tenderness steak or chops may be soaked in a marinade. This consists of an acid such as vinegar which is usually combined with oil, seasonings, and herbs.

Bacon

Grilled bacon should be crisp but not brittle. To prepare it cut off the rind, arrange the slices on the rack of the grilling pan, and place the rack 3 in. below the heat. Turn once during cooking. Remove when the bacon is light brown and crisp.

Kidneys

Sheep or lamb kidneys are suitable for grilling. Skin the kidneys and remove the core. Brush with oil or melted butter. As kidneys are small and may slip through the griller rack, they can be cooked more easily if threaded on a metal skewer. They should not be overcooked, as they tend to toughen.

Pork and Veal

Methods other than grilling are considered better for pork and veal. However, young, tender pork chops may be grilled provided they are very thoroughly cooked. As veal is deficient in fat and has a large amount of connective tissue, it will be more tender if cooked by moist-heat methods.

Poultry

Only very young chickens from six to eight weeks old and weighing about 1 to 1½ lb are suitable for grilling. The chicken is split in half or cut into suitable-sized portions and brushed well with oil or melted fat. The portions are then placed on the griller rack about 4 in. below the heat. When one side is cooked salt is sprinkled over and the portions turned and brushed with additional fat. The time required will be about 30 to 45 minutes. If a barbecue sauce (see page 504) is brushed over the portions while they are cooking, it will keep them moist as well as improve the flavour.

Fish

As fish contains only a small amount of fat, it should be well brushed with oil or butter before grilling. Most fish is suitable for grilling, particularly sole, flounder, groper, trout, salmon, and oysters. Usually from eight to 10 minutes will be adequate cooking time, but groper or salmon steaks will require longer. Oysters require merely to be heated through and will take only four to five minutes.

Meat Recipes

Filet Mignon

Use eye fillet steak cut thick. Preheat the griller. Brush the slices with melted butter or oil and place them on the griller rack about 2 to 3 in. below the heat. Adjust the heat to a moderate temperature. Grill until the top is brown. Season the top with salt and pepper. Turn the meat and grill until the second side is brown. Season the second side. Serve immediately with pan-fried mushrooms, French fried onions, or grilled tomatoes.

Grilled Steak

Use rump, sirloin, or porterhouse steak and grill as for filet mignon. Serve with maitre d'hotel butter.

Maitre d'hotel Butter

2 oz of butter
1 tablespoon of finely chopped parsley
1 tablespoon of lemon juice
¼ teaspoon of salt
Shake of pepper

Cream the butter, add the parsley, seasonings, and lemon juice. Form into a block and leave the block to harden. Shape into balls with butter pats. (If preferred hot, the butter may be melted and the other ingredients added to it.)

Pan Grilled Steak with Oyster Sauce

1 rump steak
Butter or fat
Salt and pepper

Heat a heavy frying pan and lightly grease it with butter or fat. Place the meat in the pan. Adjust the heat so

GRILLS . . .

that the meat will cook moderately slowly. Turn occasionally, using tongs or a spatula. Pour off the fat as it collects in the pan. Cook until the outside of the meat is brown and the inside rare or medium done according to preference. Season and serve immediately with oyster sauce.

Oyster Sauce

6 oysters
1 tablespoon of flour
1 tablespoon of butter
¼ cup of milk
¼ cup of oyster liquor
¼ teaspoon of salt
Shake of pepper
1 teaspoon of lemon juice

Melt the butter, add the flour, salt, and pepper and cook until frothy but not brown. Remove from the heat, add the milk, and stir until smooth. Return to the heat and cook until thick. Remove from the heat, add the oyster liquor, and cook. Cut the oysters into halves or quarters. Add the oysters to the hot sauce and heat gently but do not boil. Remove from heat and add lemon juice. If a richer sauce is desired, add one egg yolk or two tablespoons of cream before adding the oysters.

Hamburg Steaks

1 lb of mince
2 tablespoons of chopped onion
1 egg
½ cup of fresh breadcrumbs
¾ teaspoon of pepper
2 tablespoons of chopped parsley
2 tablespoons of tomato sauce
1 tablespoon of Worcester sauce
½ teaspoon of salt

(Five servings)

Saute the onion in a little bacon fat. Beat the egg slightly. Combine all the ingredients and shape into five patties. Wrap a strip of bacon round the outside of each patty and secure with toothpicks. Place on a rack under the preheated griller about 3 in. from the heat and cook at moderate temperature. When half done and brown on top turn and brown on the other side.

Marinated Lamb Chops

6 lamb loin chops
½ cup of olive oil
¼ cup of vinegar
Juice of 1 lemon
1 bay leaf (crumpled)
½ teaspoon of peppercorns
2 onions (finely minced)
Salt and pepper

Cover the chops with a mixture of the oil, vinegar, lemon juice, and seasonings. Allow to stand in a cool place for two to three hours. Preheat the griller. Remove the chops from the marinade and place on a rack about 3 in. from the source of heat. Regulate the griller so that the chops will cook at a moderate temperature. When the chops are browned on one side turn and finish cooking on the other side. Time, 12 to 15 minutes.

Mixed Grill

A mixed grill consists of two or more kinds of meat grilled with vegetables or fruits. Choose an interesting combination of foods which will require about the same time for cooking or add those which require a shorter time as cooking progresses.

Before beginning prepare either French fried or straw potatoes or potato crisps and keep hot. Prepare maitre d'hotel butter.

The grill may be selected from the following:

Meat: Steak or chop, kidney, sausage, bacon, or precooked sweetbreads.

Vegetable: Mushrooms or tomatoes.

Fruit: Apple rings, pineapple slices, or tinned peaches or apricots.

Place mushrooms or tomatoes in the pan of the griller, where they will cook in the drippings from the meat. Brush the meats with melted butter or fat and arrange on the rack. If using apple rings or fresh pineapple, brush with melted butter. Tinned fruits have sufficient syrup to grill without butter. Place the grill 2 to 3 in. from the heat and cook at moderate temperature.

Serve immediately with maitre d'hotel butter and the crisped potatoes.

Kebabs with Pilaff

½ lb of lean mutton
½ lb of rump steak
3 lambs' kidneys
3 rashers of bacon
Pineapple chunks

Marinade

4 tablespoons of salad oil
3 tablespoons of vinegar
Salt
Black pepper
1 bayleaf
1 crushed clove of garlic

Trim the mutton and steak of all fat and gristle and cut them into cubes. Mix the marinade ingredients and pour them over the meat cubes. Steep the meat for two hours or longer. Skin the kidneys, cut in halves, and remove the cores. Remove the rind from the bacon, cut each rasher into two, and shape into rolls. Place the pieces of meat on skewers alternating with the other ingredients, and grill until the meat is tender, turning frequently. Serve on a bed of pilaff or plain boiled rice.

Pilaff

2 oz of butter
6 oz of rice
Salt and pepper
1 skinned tomato
¾ pint of stock or water

Heat the butter, add the rice, and cook until it is slightly browned. Add seasonings, tomato, and stock or water and simmer until liquid is absorbed.

Grilled Kidneys with Bacon and Tomato

6 sheep kidneys
Bacon slices
3 tomatoes
6 slices of toast
¼ cup of oil
½ cup of vinegar

Skin the kidneys, split in halves, and remove the cores. Place in a marinade made from a mixture of the oil and vinegar and leave for an hour or more. Drain. Wrap each piece of kidney in a slice of bacon and fasten with a toothpick. Grill for five to eight minutes, turning frequently. Serve on toast and garnish with fried tomato slices.

Chicken Livers en Brochette

Cut chicken livers into small squares. Cut bacon into squares the size of the pieces of liver. Place alternate squares of bacon and liver on skewers, beginning and ending with the bacon. Preheat the griller. Cook at a moderate temperature for about 15 minutes, turning several times during cooking.

Bacon Open-faced Sandwich

6 slices of bread
6 rashers of bacon
12 slices of cheese
12 slices of tomato

Toast one side of the bread. Butter the untoasted side. Place two slices of the tomato on each slice of bread, cover with two slices of the cheese and two half rashers of the bacon. Toast under the griller until the bacon is cooked and the cheese melted.

Bacon Appetisers

Wrap stuffed olives, cooked pitted prunes, or oysters in thin slices of bacon. Secure with toothpicks. Grill at a moderate temperature until the bacon is cooked. Serve immediately.

Barbecue Sauce
(Suitable for basting grilled chicken)

2 tablespoons of oil
2 tablespoons of vinegar
1 teaspoon of mixed mustard
1 tablespoon of Worcester sauce
3 tablespoons of tomato sauce

Combine all the ingredients and mix thoroughly.

Fish Recipes

Grilled Oysters on Shell

6 oysters
2 tablespoons of Worcester sauce
2 tablespoons of tomato sauce
1 rasher of streaky bacon
Salt and pepper
Lemon

(One serving)

Place the oysters on half shells. Season with the salt and pepper. Add a few drops of the Worcester sauce to each and cover with the tomato sauce. Cut the bacon into pieces about an inch square. Place one piece on top of each oyster. Place under the grill and cook gently until the bacon is cooked. Serve with the quartered lemon.

Grilled Crayfish

1 medium-sized boiled crayfish
2 tablespoons of butter
2 tablespoons of flour
1 cup of milk (or ¾ cup of milk and ¼ cup of sherry)
Salt and pepper
Dash of paprika
⅛ teaspoon of mustard
1 tablespoon of chopped parsley
2 oz of cheese (grated)
Buttered breadcrumbs
Lemon

Cut the crayfish in halves lengthwise; remove the flesh from the shell and pull out the long sinew. Cut the flesh roughly. Make a sauce as follows: Melt the butter, add the flour, and stir and cook until frothy but not brown. Add the milk gradually and cook until the sauce thickens. Add the seasonings and parsley. Remove from the heat and add the grated cheese. Add the crayfish meat and heat through but do not allow to boil. Fill the washed shells with the mixture. Sprinkle with the buttered breadcrumbs. Place under the griller and grill until golden brown. Serve garnished with slices of the lemon and the crayfish claws.

Photograph by Green and Hahn.

Lighting in the Home

By CHRISTINE LYONS,
formerly Home Science Instructor,
Department of Agriculture, Auckland

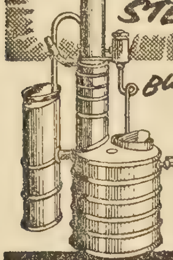
FROM the Stone Age until the reign of the first Queen Elizabeth animal fats were used to provide lighting. Then came oil, petroleum gas, and coal gas, and finally, at the beginning of this century, electricity. Over the past 20 years lighting has greatly expanded, but even now few homes, whether in the city or in the country, have really adequate light everywhere it is needed. Important aspects of good lighting are where, how much, and what kind of light is needed. These points will be discussed in two articles. In this article lighting will be discussed in general terms. "Lighting Room by Room" is the subject of the second article, to appear next month.

THOSE living in parts of the country where electricity is a recent arrival or even yet to come will know the great convenience that even a few light bulbs will bring. That, however, is only the beginning and it is worth while to ensure that the best value is obtained from home lighting. A well lit home has many

AT RIGHT:

Upper—Localised light is provided by the contemporary wall fitting above the chair. This fitting can be moved to any desired angle. The ceiling lamp gives general diffused light.

Lower—A combination of fluorescent and incandescent lighting. Fluorescent lights run the full length of two walls (one shown) and are concealed by venetian blind slats. This gives a neat appearance and excellent general light. The wall bracket lamps are incandescent and give both direct and indirect light.



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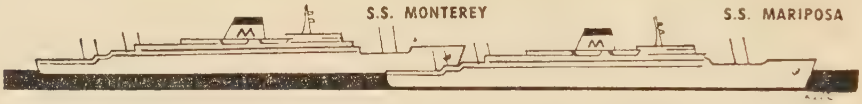

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advantages: There is much less likelihood of accidents, it helps to relieve eyestrain, it is very much easier to work in, and it has a pleasant appearance.

Wiring

The concept of lighting has changed greatly over the past few years. Before that it was usual to have one central ceiling light and perhaps one wall point per room. With more and more uses for electricity this skimpy wiring can be a great handicap. It is therefore essential if building or having electricity installed for the first time, to spend some time working out a plan for present and for future needs to make certain that there are sufficient power points to cope with the family's activities.

Extending the wiring system in a house is very expensive, as the wires are brought through existing walls. This, of course, must be done by a registered electrician. However, if the wiring system is going to be extended, it is just as essential to plan for this as it is when planning for a new home, and electricians will advise on all regulations and safety precautions.

The majority of rooms need overall lighting (general lighting) and ceiling fixtures are the simplest means of providing this. In addition, good local light is needed for certain areas. This may be provided by installed fixtures, for example, a light over the sink or over the stove in the kitchen, by wall brackets, or by portable table or standard lamps in rooms where furniture may be moved frequently.

There are certain new fixtures which may now be incorporated in wiring. One of these is a time-lag switch. This is very useful for an outside light, as the switch may be turned off but the light will not go out for approximately a minute afterward.

Fixtures for General Lighting

Light fixtures distribute light directly, indirectly, or both.

Direct and semi-direct: This type of light is directed downward. It can create shadows, but when it is supplemented with table or portable lamps it provides adequate illumination and the shadows can be controlled. This form of lighting is better used for places where a lot of light is needed for a short time.

Semi-indirect and indirect: This sends most of the light upward to be directed from the ceilings and walls. It is very soothing and is the best quality of light available. It is, however, necessary to have light-coloured ceilings and walls, for if they are dark, much of the light is absorbed and it is not practical to have this type of light under such circumstances. A black surface will absorb 85 per cent of the light, whereas a white surface will reflect 85 per cent.

Working areas in this kitchen are adequately lit by fluorescent lights.

General diffuse lighting: This again is a soft type of light. The lamp shades or fittings which produce this type of light are translucent.

Good Lighting

1 Good lighting means enough light; the amount needed will vary according to the type of work being done. It is most important to ensure that in each room there will be sufficient adaptable light for the most exacting work to be done there. Fine needlework, sewing dark materials, and reading are activities for which most light is needed. Adaptable light

can be turned on and off at will; in other words, it is available when it is wanted and need not be used the whole time.

2 Good lighting should be free from glare. Direct glare from a very bright, unshaded clear bulb can cause considerable eyestrain in the same way as can reading or other close-seeing work done in strong sunlight or the glare at night from car headlights on full beam. Reflected glare caused by a light reflecting from a shiny surface also causes eyestrain. Glossy paper on walls, shiny paint, mirrors, or metal or glass objects may reflect glare on the eyes. Both direct and reflected glare can be decreased or even eliminated by the proper use of lighting fixtures and shades.

3 Good lighting keeps shadows off the work which is being done. The central room fixture needs to be supplemented by other sources of light. A good example of the necessity for this can be seen in many kitchens. If there is one central ceiling light it can be extremely difficult to wash up the dishes efficiently, as the person working at the sink is constantly blocking the light. A supplementary light placed directly over the sink will prevent the shadow problem.

4 Good lighting should be well distributed. Sharp contrasts of light and dark should be avoided, because adjustments the eyes must make cause eyestrain. Where reading or work is done by the light of a table lamp there should be general lighting as well so that these adjustments do not have to be made.

Types of Light

There are two main methods of producing light with electricity:

Incandescent

This is the more familiar and is produced by passing an electric current through a fine wire filament enclosed in a bulb from which the air has been extracted. Household bulbs are made in a wide range of wattages (from 15 to 200 watts). There are also tiny bulbs such as are used for nursery night lights or decoration for Christmas trees. The amount of electricity used by these is almost negligible. Incandescent lighting produces great glare and there must be some form of diffusion to decrease it. This is normally accomplished by lamp shades. There are several types of incandescent lights:

Pearl lamps: These are frosted to diffuse the light and reduce the brightness. They give approximately the same amount of light as clear glass ones of equivalent wattage and are the best value for most purposes.

Silica-coated lamps: These are a recent development and are especially useful for fittings which give a proportion of direct lighting. They have an internal coating of silica and give a very soft, diffuse light which is especially suitable for reading or close work. They are a little more expensive than pearl lamps.

Pink-tinted lamps: These also have a silica coating and are a recent introduction in New Zealand. They give a warm glow and a very flattering light, but again are slightly more expensive.

Tubular or strip lighting: This is available in varying lengths, from 12 to 48 in., and can be used effectively for decorative purposes. Because of their length these lamps give a more diffuse light and can be used with or without shades. They have a white inside coating to the bulb and supply a comfortable light.

Planning Pays

PROSPECTIVE home builders are strongly recommended to discuss lighting with a lighting company in the early stages of planning a building. Adding to electrical wiring after the building has been completed is very expensive.

Candle lamps: These usually have a lower wattage, 60 watts being the highest available. They are suitable for candelabra of all kinds and fixtures of more contemporary designs. They need shades unless well above eye level. The bulbs can be plain or twisted with a clear or frosted effect and the latter are usually silica coated.

Clear lamps: These are almost unobtainable today and they are not generally recommended for domestic purposes, as they tend to make harsh shadows.

Fluorescent Lighting

In a fluorescent tube electricity is discharged through a vapour. This action produces invisible ultra-violet rays which are changed to visible rays when they fall on special fluorescent materials coating the inside of the tube. These coatings determine the amount and the colour of the light.

Fluorescent lighting is available in a fairly large range of colours. Because the light source is spread over a long length, it casts few shadows and gives very little glare. These tubes are also very safe to use in restricted places, as they do not get hot. This type of lighting is, therefore, particularly recommended for kitchen, bathroom, and work-room lighting and for concealed lighting such as under pelmets or behind curtains.

Fluorescent fixtures are more expensive than incandescent ones and tubes cost more than bulbs. To offset this, however, fluorescent lamps have a higher efficiency, they last much longer, and they yield several times as much light for a given wattage.

The range of fluorescent fittings is increasing, but in general they are not as attractive as the incandescent fittings and do not always fit in with home interior decoration. The colour range of the light is a little different from that of incandescent and may prove displeasing by distorting the tones of furnishings. If consideration is being given to installation of this lighting, expert advice on colour range should be sought. Most lighting firms will advise on lighting problems.

Combinations

Combinations of fluorescent and incandescent can be used to very good effect. The background or concealed light can be fluorescent and the localised lighting (table lamps, standard lamps, and wall bracket lights) can be incandescent. This is where the best of the two types is obtained.

Fluorescent lights can sometimes cause interference with radio and television, but there are simple methods for overcoming this and most of this interference relates to the older types of fittings. Fluorescent lights are available in 2, 3, 4, 5, and 8 ft lengths and in a 16 in. diameter circular fitting.

If they are to work from a direct current supply—one or two small areas in some cities and elsewhere still have this type—fluorescent fittings have to be specially modified.

Photographs by Sparrow.

Storage of Clothing in Polythene Bags

THE larger polythene bags used extensively by the clothing trade for packaging many products have a variety of similar uses in the home. For example, they are very handy for packing blouses and other light articles in a suitcase for travelling. Creasing is greatly reduced and handling of the article itself is avoided entirely once it has been placed in the bag.

However, these bags are not suitable for prolonged storage of clothing in drawers or wardrobes if it is necessary for the bags to be sealed to protect woollens, furs, etc., against moth and beetle attack. Temperature change on the inside and outside of the bag causes condensation of moisture on the inside which may create mildew and rust stains from metal fastenings or pins.

—*MAUD B. STRAIN,*
Home Science Instructor,
Department of Agriculture,
Dunedin

Colour in the Winter Flower Garden

By J. P. SALINGER,
Horticulturist,
Department of Agriculture,
Wellington

A GARDEN need not be dull and unattractive in winter if thought is given to the establishment and placing of suitable plants. In addition to flowering plants, and trees and shrubs with berries, coloured bark and leaves can also be used. This article describes suitable plants for winter colour for gardens in all parts of the country.

IN many parts of New Zealand winter is usually just a cooler time of the year, when deciduous trees lose their leaves for a short period and frosts occur occasionally. In these areas a great variety of winter-flowering trees and shrubs can be grown and many bedding plants flower satisfactorily. Where heavier frosts occur there are fewer trees and shrubs flowering at this time, but the garden can still be colourful if suitable plants with berries or ornamental foliage are grown.

By careful choice and planting it is possible to gather flowers during the whole winter, except in areas which experience intense frost and snow. Even so, the more delicate small plants, such as hellebores or early primulas, flower if protected with cloches. There are winter-flowering bulbs, herbaceous plants, shrubs, and trees and if these are planted where they are protected from cold winds, they will make a display when colour is usually lacking in the garden.

[Elliott

Camellias are outstanding for providing winter colour.

Placing the Plants

It is most important to select suitable positions for all the plants to obtain the best effect from their colour in winter. The smaller plants should be set out in protected pockets facing north-east, so that they will receive the maximum sun in midwinter. Trees and shrubs with coloured foliage should be backed by darker evergreens, and small trees like *Acacia baileyana* and the early prunus can also be planted where their flowers can be seen against the sky.

Witch hazel, winter sweet, and daphne, which have rather inconspicuous but fragrant flowers, may be planted near the house so that their scent can be enjoyed outdoors in fine weather. Some plants like the early narcissus have large and persistent leaves; they should be planted in groups in the less obvious parts of the garden; in fact Paper White and Soleil d'Or narcissus grow quite well at the base of hedges, if manured regularly each autumn with bone meal.

CHOICE OF PLANTS FOR COLDER AREAS

Bulbs and Perennials

Many of the early-flowering bulbs grow better in cooler areas and can be used either for an edging to a border or in groups in mown grass under deciduous trees. Snowdrops, winter aconite, and crocuses are all suitable for these situations and when established they may be left in the

Winter feature				Height			Botanical name	Common name	Climate			Position			Soil		
Flowers	Foliage	Fruit	Bark	To 3 ft	3 to 10 ft	Over 10 ft			Hardy	Average	Frost tender	Sun	Average	Shade	Dry	Average	Moist
☆					☆		**Abutilon hybridum*†*	Chinese lanterns		☆			☆			☆	
			☆		☆		*Acer palmatum†*	Maple	☆				☆	☆		☆	
☆						☆	**Acacia baileyana*	Wattle		☆		☆			☆		
☆				☆			**Adenandra fragrans*	..		☆			☆			☆	
☆					☆		*Agonis juniperina*	Juniper myrtle			☆		☆			☆	
		☆				☆	*Arbutus unedo*	Strawberry tree	☆				☆			☆	
	☆	☆		☆			*Aucuba japonica†*	..	☆				☆			☆	
☆				☆			*Azalea indica*	..		☆				☆			☆
☆					☆		**Banksia ericifolia*	..		☆		☆			☆		
☆	☆				☆		*Begonia lucerna*	Cane begonia			☆			☆		☆	
☆				☆			*Beloperone guttata*	Lobster plant			☆		☆			☆	
	☆	☆		☆			**Berberis thunbergi†*	Garden barberry	☆			☆	☆		☆	☆	
			☆			☆	**Betula alba*	Silver birch	☆				☆			☆	
☆				☆			*Boronia megastigma†*	..		☆			☆				☆
☆				☆			**Bouvardia humboldti*	..			☆		☆			☆	
	☆				☆		*Brachyglottis repanda†*	Rangiora	☆					☆		☆	
☆					☆		*Brunfelsia latifolia*	..			☆		☆			☆	
		☆			☆		**Callicarpa giraldiana*	..	☆				☆			☆	
☆					☆	☆	**Camellia japonica†*	..	☆				☆			☆	
☆					☆	☆†	*C. sasanqua†*	..	☆				☆			☆	
☆					☆		**Cassia corymbosa*	..		☆		☆			☆		
	☆					☆	**Cedrus atlantica glauca*	Blue Atlantic cedar	☆				☆			☆	
		☆				Cl	*Celastrus scandens*	..		☆			☆			☆	
☆					☆		*Cestrum newelli*	..			☆		☆			☆	
☆					☆		**Chaenomeles lagenaria*	Japonica	☆				☆			☆	
	☆				☆	☆	*Chamaecyparis lawsoniana crippsi†*	Lawson cypress	☆				☆			☆	
	☆				☆	☆	*C. obtusa†*	Hinoki cypress	☆				☆			☆	
☆					☆		*Chimonanthus fragrans†*	Winter sweet	☆				☆			☆	
☆		☆			☆		**Citrus*	Orange, lemon, etc.		☆	☆		☆			☆	
☆						Cl	*Clematis cirrhosa*	..		☆			☆				☆
☆					☆		*Coleonema pulchrum*	Pink diosma		☆		☆			☆		
	☆				☆		*Coprosma baueri variegata*	Taupata		☆			☆			☆	
☆				☆			**Correa speciosa*	Australian fuchsia		☆		☆			☆		
			☆		☆		**Cornus alba†*	Dogwood	☆				☆			☆	
		☆			☆		**Cotoneaster harroviana*	..	☆				☆			☆	
	☆	☆		☆			*C. horizontalis*	..	☆				☆			☆	
☆				☆			*Cuphea ignea*	Cigarette plant		☆			☆			☆	
	☆					☆	*Cupressus macrocarpa lambertiana*	..	☆				☆			☆	
☆				☆			**Daphne odora†*	..		☆			☆	☆			☆
☆					☆		*Diosma ericoides*	Breath of heaven		☆		☆			☆		
	☆				☆		*Dodonaea viscosa purpurea*	Purple akeake		☆			☆		☆		
☆					☆		*Dryandra formosa*	..		☆		☆			☆		
☆					☆		*Edgeworthia papyrifera*	..	☆					☆		☆	
☆				☆			*Epacris impressa*	Australian heath		☆				☆			☆
☆				☆			**Erica carnea*	Heaths	☆*	☆			☆*	☆		☆	☆
☆					☆		*Eriostemon myoporoides*	..		☆		☆			☆		
	☆	☆				☆	**Eugenia myrtifolia*	Rose apple			☆		☆			☆	
		☆			☆		*Euonymus europaeus*	Spindle tree	☆				☆			☆	
	☆					☆	*Euonymus japonicus aureus*	..	☆				☆			☆	
☆						☆	*Eucalyptus leucoxylon rosea*	Winter red gum		☆			☆			☆	
☆					☆		*Euphorbia pulcherrima*	Poinsettia			☆	☆				☆	
☆				☆			*Euryops tenuissimus*	..		☆		☆			☆		
			☆			☆	*Fraxinus excelsa aurea*	..	☆				☆			☆	
☆				☆			*Fuchsia* Gartenmeister Bronstedt	..			☆		☆			☆	
☆						☆	*Garrya elliptica*	..	☆				☆			☆	
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☆						☆	*Hakea laurina*	..			☆	☆			☆		
☆					☆		**Hamamelis mollis*	Witch hazel	☆				☆			☆	
☆					☆		**Hebe speciosa*	Veronica, koromiko	☆				☆			☆	
	☆					☆	*Hoheria populnea variegata*	Lacebark		☆			☆			☆	
		☆				☆	*Idesia polycarpa*	..		☆			☆			☆	
	☆	☆				☆	*Ilex aquifolium†*	Holly	☆				☆			☆	
☆						Cl	**Jasminum nudiflorum*	Jasmine	☆*	☆			☆			☆	
	☆				☆		*Juniperus pfitzeriana†*	Juniper	☆				☆			☆	
☆				☆			*Lantana sellowiana*	..			☆	☆			☆		
☆					☆		*Leptospermum scoparium keatleyi†*	Manuka	☆				☆			☆	
	☆			*☆		☆	**Leucadendron argenteum*	Cape silver tree		☆		☆			☆		
☆				☆			*Leucothoe catesbei*	..	☆					☆			☆
☆				☆			*Lhotzskya genetylloides*	..		☆			☆			☆	
☆					☆		*Loropetalum chinense*	..		☆			☆			☆	
☆					☆		**Luculia gratissima*	..			☆		☆			☆	
☆						☆	**Magnolia campbelli*	..	☆				☆			☆	☆
		☆			☆		**Malus* "Gorgeous"†	Crab apple	☆				☆			☆	
	☆				☆		*Metrosideros tomentosa variegata*	..		☆			☆			☆	
☆				☆			*Micromyrtus microphylla*	..		☆			☆			☆	
	☆				☆		*Myrtus bullata*	Rama-rama		☆			☆			☆	
	☆	☆			☆		**Nandina domestica†*	..		☆			☆			☆	
		☆			☆		*Ochna multiflora*	..		☆			☆			☆	
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		☆		☆			*Pernettya mucronata*	..	☆					☆			★
	☆			☆			*Phormium tenax tricolor†*	N.Z. flax	☆				☆			☆	
☆					☆		*Phylica plumosa*	..			☆	☆			☆		
	☆					☆	*Picea pungens glauca†*	Silver spruce	☆				☆			☆	
☆					☆		*Pieris japonica*	..	☆					☆			☆
	☆				☆		**Pittosporum tenuifolium*	Kohuhu		☆			☆			☆	
☆	☆				☆		**Podalyria calyptrata*	Satin bush		☆		☆			☆		
☆					☆		*Polygala grandis*	..	☆				☆			☆	
☆					☆		**Prostanthera rotundifolia*	Mint bush		☆			☆			☆	
☆						☆	*Prunus mume*	Japanese apricot					☆			☆	
☆						☆	*P. subhirtella autumnalis*	..	☆				☆			☆	
		☆			☆		**Pyracantha coccinea*	Firethorn	☆				☆			☆	
☆					†☆	☆	*Rhododendron* "Sir Robert Peel"†	..		☆			☆			☆	

same position for several years. Early narcissus like Soleil d'Or, Golden Spur, and Erlicheer will also flower in winter, but the last should be lifted and replanted every three years.

Anemones, if planted in January or February, will flower until frosts come, and it may then be advisable to dispose of these if damaged by weather and wait for the later-planted ones to flower in spring. Anemone species such as *A. fulgens* and *A. blanda* are quite hardy and can be left in the same position for several years.

Among the perennials, *Iris unguicularis* (*I. stylosa*) is outstanding in providing flowers throughout winter; the leaves should be trimmed back slightly in March so that the flowers can be picked more easily, and slugs and snails should be regularly controlled with metaldehyde baits during the flowering period. The closely related *Hermodactylus tuberosus* flowers at this time of year. The bulbous *Iris tingitana* will usually flower only in the warmer areas.

Certain primroses and primulas, notably *Primula wanda* and *P. juliae*, will flower during winter and early spring in the cooler districts, and if mulched with leaf mould or old compost and manured with bone meal in autumn, will grow and flower for many years in the same position. The bulbous scillas and chionodoxas provide a good contrast in colour when interplanted with these primulas.

There are several species of hellebores which flower at this time of year, *Helleborus niger* and its varieties being the true winter-flowering types. These are often called winter or Christmas roses, but the name hellebore is really more appropriate. Other species flower in spring.

Violets are valuable winter-flowering plants. They grow best in a slightly shaded position, and during summer they should be sprayed or dusted regularly with captan and malathion to control leaf diseases and insects such as red spider mite and aphids. The longest stems and finest flowers are obtained when fresh runners from older plants are set out each year in early summer in well manured ground; for general garden display the clumps can be left for two or three years provided they are manured, mulched with organic matter, and well watered during summer.

Few of the taller and more showy bedding plants will flower in winter in the colder areas, but some dwarfer plants like *Bellis perennis*, *Arabis albida*, and *Pyrethrum aureum* (golden feather) will provide a bright edging to a bed or border.

In protected areas stocks will flower in winter, especially the ten-week stocks, if sown early enough to make a large plant by April. The biennial Brompton stock will flower in the second winter.

Trees and Shrubs

Only a limited number of outstanding winter-flowering trees and shrubs are suitable for cold, frosty areas.

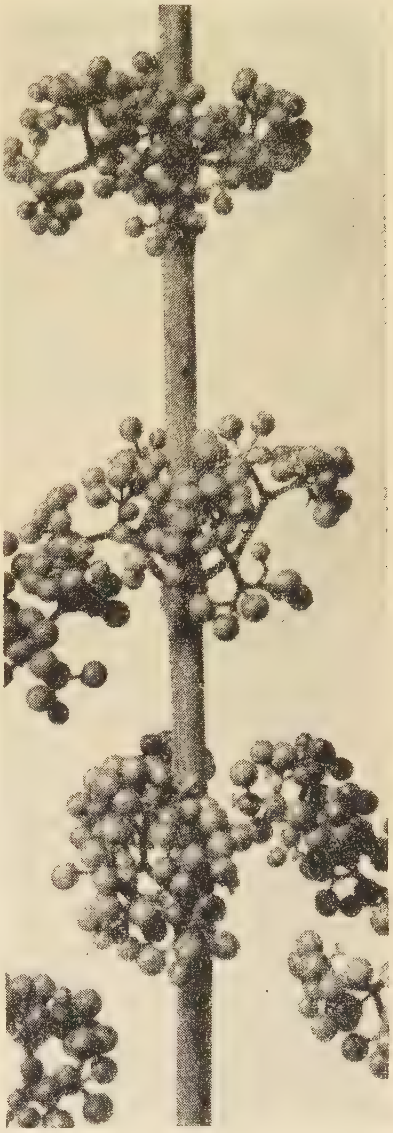
Plants to Give Colour in the Winter Garden

THE list on the opposite page and at the foot of this page gives the trees, shrubs, and climbing plants (Cl in list), which provide winter colour. Those above 10 ft are mostly trees. Hardy plants will withstand severe frosts, and average plants will grow in the warmer parts of the South Island and most parts of the North Island.

A sunny position denotes that the plants flourish when exposed to full sun all the year round; shady position infers broken shade under trees or facing south.

A dry soil would be a light, sandy soil in an area of low rainfall; a moist soil is one reasonably moist all the year round.

The sign * means that there are other suitable species; the sign † that there are other suitable varieties of the species listed.



Callicarpa purpurea is a hardy shrub with mauve-purple berries.

Winter feature				Height			Botanical name	Common name	Climate			Position			Soil		
Flowers	Foilage	Fruit	Bark	To 3 ft	3 to 10 ft	Over 10 ft			Hardy	Average	Frost tender	Sun	Average	Shade	Dry	Average	Moist
☆					☆	Cl†	*Rosa* "Lorraine Lee"†				☆		☆			☆	
☆				☆			*Rosmarinus officinalis*†	Rosemary	☆				☆		☆		
		☆		☆			*Ruscus aculeatus*	Butcher's broom	☆					☆			☆
☆					☆		*Salix daphnoides*	Pussy willow	☆				☆			☆	☆
			☆			☆	*S. babylonica*	Weeping willow	☆				☆			☆	☆
	☆			☆			*Senecio greyi*		☆				☆			☆	
	☆	☆			☆		*Stransvaesia davidiana*		☆				☆			☆	
		☆		☆			*Symphoricarpus racemosus*	Snowberry	☆					☆			☆
☆					☆		*Templetonia retusa*			☆			☆		☆	☆	
☆				☆			**Thryptomene calycina*			☆			☆			☆	
	☆				☆		*Thuya occidentalis lutea*†		☆				☆			☆	
☆					☆		**Tibouchina semidecandra*	Lasiandra			☆		☆			☆	
☆					☆		**Viburnum fragrans*		☆				☆			☆	

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Marathon
BY SKELLERUP
GUMBOOTS

Fortunately, some of the dwarf heaths are hardy and more tolerant of a neutral or slightly alkaline soil than are the half-hardy species; a good display can be obtained by planting *Erica carnea* and its varieties and *E. darleyensis*.

On the other hand, plants with berries usually do better than in the warmer parts of the country. Plants with coloured foliage are valuable both for garden and indoor decoration.

In winter the coloured bark of varieties of deciduous trees and shrubs such as birch, maples, and dogwoods can also be enjoyed. These may be planted on a northerly aspect so that the winter sun shines on the bark and also penetrates through the branches, and shade is provided in summer.

Berried Shrubs

Some of the berried shrubs are unisexual and with these both male and female plants should be grown, or the female plant only if there are others of the species in the vicinity. Plants which require both sexes for pollination are *Aucuba japonica*, *Celastrus scandens*, holly, and *Skimmia japonica*.

The japonicas are especially useful, as they carry fruit in autumn and flowers in winter and spring. They can be grown as specimen shrubs or used as an informal hedge; for the latter purpose they should be lightly trimmed in December.

Coloured Foliage

Trees and shrubs with coloured or variegated leaves include silver, gold, and grey-green varieties of most of the conifers, many of them less vigorous than the green varieties and so more suited for small gardens or even rock gardens. Many varieties of holly have variegated leaves and can be doubly decorative, as the female plants should also produce berries.

The golden-leafed varieties of *Euonymus japonicus* and privet are useful hardy shrubs, but they have a tendency to revert to the green-leafed type. All shoots reverting in this way should be cut out as soon as they are seen.

Many New Zealand native plants have attractive coloured foliage, such as the bronze of *Myrtus bullata* or the grey of *Senecio greyi*. In addition, there are attractive variegated varieties of coprosma, hoheria, phormium, and pittosporum, and these compare favourably with any introduced plants. The variegated pohutukawa is a most attractive plant, but is not suitable for the coldest districts.

CHOICE OF PLANTS FOR WARMER AREAS

A wide variety of attractive trees and shrubs can be grown in areas which do not have intense winter frosts or persistent cold temperatures; in addition, many bedding plants flower well through winter, and South African bulbs provide colour early in the season.

[*Elliott*

The pink flowers of *Magnolia campbelli* are seen at their best when silhouetted against the sky.

Bulbs and Perennials

The cold-climate bulbs are less satisfactory in the warmer areas, but others can be grown. All narcissus flower well and anemones planted in March should flower by late June and continue through spring. In addition, lachenalias and cyrtanthus both flower in midwinter in frost-free areas.

Gladiolus psittacinus is useful both in the garden and as a cut flower. The white arum lily begins flowering in late winter and can be naturalised in damp soil in the less formal parts of the garden.

▼ Iceland poppies will flower in winter in all the warmer districts.

[*Elliott*

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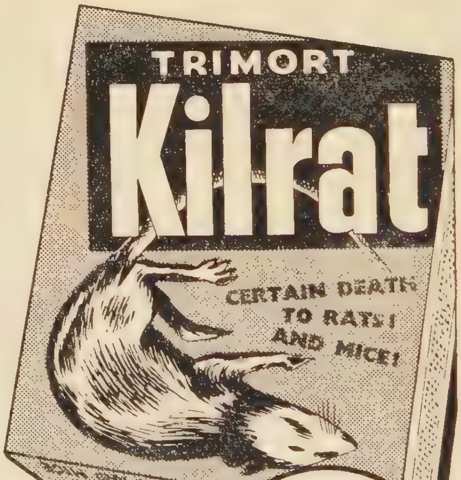
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The red hot poker, *Kniphofia zululandia*, is an outstanding winter-flowering plant, and the winter hellebores can be grown successfully in [illegible] areas. Many trailing plants [illegible] dimorphotheca, and gazanias will flower in late winter.

Echeveria multicaule is an attractive winter-flowering succulent and some other genera, such as aeonium and euphorbia, flower easily.

Bedding Plants and Annuals

Planning for winter colour with annuals should be done in February.

A garden in the warmer areas can be kept bright throughout winter with suitable bedding plants and annuals. These should be well established before the weather becomes too cold, and March or early April are the latest times for planting the majority of quick growing plants.

Pansies and violas will begin flowering in autumn and continue flowering until spring; nemesias grow very quickly and flower for a longer time in cool weather. In April nasturtiums can be sown where they are to flower, and winter-flowering sweet peas should be sown in February to make sufficient growth before winter.

Iceland poppies are probably the most effective winter-flowering plants; they require a well manured, well drained soil, and the plants should be set out in February to form large crowns before the colder weather. During the early part of the season aphids and thrips should be controlled with insecticides to prevent damage to the plants and infection from virus diseases which these insects transfer.

Trees and Shrubs

There is a wealth of winter-flowering trees and shrubs which can be grown in these areas; some of them are frost tender and it is seldom worth trying to grow these where there are occasional severe frosts or the average temperature is too low. Plants like poinsettia, luculia, and lasiandra are seldom satisfactory in these conditions, and even in the warmer areas they are more satisfactory if given the protection of other shrubs or grown near the house.

Citrus trees are both ornamental and decorative; the Meyer lemon is suitable for most areas and the Ponderosa or "wonder lemon" is also reasonably hardy. In the warmer parts of the country standard lemons, grapefruit, oranges, and mandarins can all be grown as individual specimen trees in the ornamental part of the garden. All citrus require ample manuring and water and routine spraying with white oil to control insects and with copper fungicides to control leaf diseases. It is well worth while giving these plants adequate and regular attention, as they will repay this in the fragrance of blossom and the beauty and utility of their fruit.

The wide range of plants available makes possible a winter-flowering area in the garden; preferably this should be visible from the windows of the house. The ground could be carpeted with species of half-hardy heaths, and stronger-growing camellias could provide a solid green background.

By suitable pruning in March certain roses will flower well in winter; these are mainly hybrids of *Rosa gigantea*, notably Lorraine Lee and its climbing sport, and Sunny South; both were bred in Australia.

Garden Work for June

By ROSALIE A. CAMPION,

Horticultural Instructor,
Department of Agriculture,
Wellington

Between the rainy periods there is usually opportunity to complete outstanding tasks in the flower garden.

Planning and Reconstruction

Most gardeners will find it helpful to have a plan of their gardens on which the overall pattern can be set out. This should ensure that each feature will be given the prominence it deserves and that there will be no crowding of plants. Alterations and extensions are best set out on paper first.

Plans and alterations can now be implemented. If lawns are being altered, the turves should be cut into even shapes of manageable size. A depth of 3 to 4 in. is desirable. Where a new lawn is being prepared now, the soil should be well compacted and the topsoil removed to a depth of 3 to 4 in. The turves can then be fitted into position, friable soil being used to fill the gaps or to raise the levels. The new lawn edge should extend further than is necessary and be cut back with a sharp spade when growth starts and rains have compacted the turves.

Crazy paving can be constructed now. It should be laid on a consolidated foundation which should be topped off with 1 in. of sharp sand. Time spent on consolidating foundations will mean little maintenance in the future. Stones which have become loose or steps unsafe should now be reset.

Trellising and Garden Furniture

With maintenance, wooden structures may last a reasonable time in a garden. They should be examined and any rotting boards replaced. When new trellising is being erected the boards should be painted before they are overlapped so that the joints, which are so vulnerable to rotting, are adequately protected.

A set of compost bins could be made during winter from concrete or bricks. Boxes measuring 3 ft x 3 ft x 3 ft, with front opening and provision for ventilation, are satisfactory.

A cold frame, as mentioned last month, is a valuable piece of equipment.

[Green and Hahn

Cyclamen plants coming into flower will benefit from dressings of weak liquid manure.

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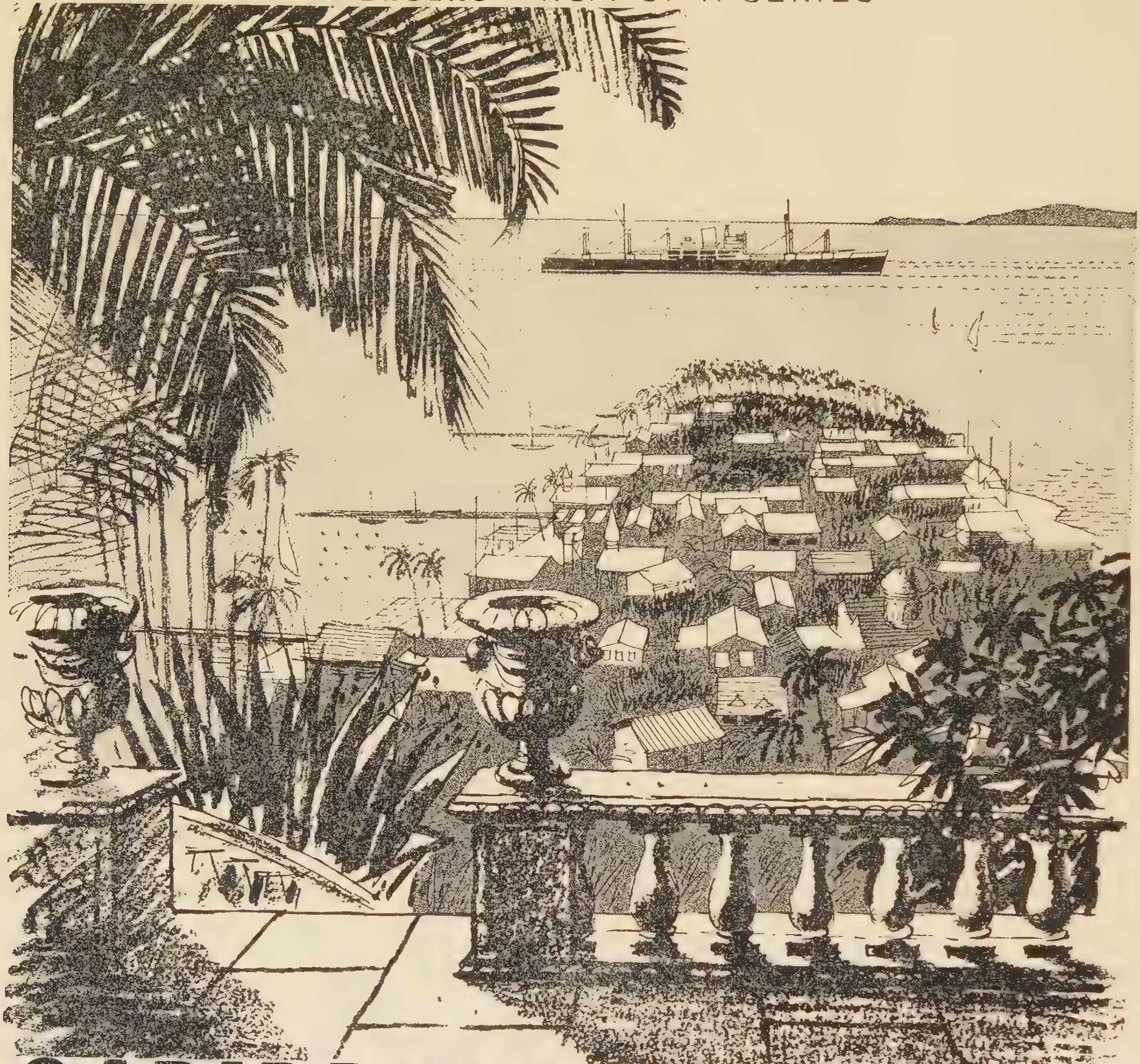

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Agapanthus, the African lily, which can be planted out now to give a display during summer.

Planting of Trees and Shrubs

Nurserymen have a wide range of flowering plants which can be planted out now when soil conditions are suitable. Planting should not be attempted if the soil sticks to the shoes, because when plants are set out such soil may be so compacted as to prevent sufficient circulation of soil air in the root area.

Before balled plants are planted the scrim should be removed and the ball of soil broken gently to allow the roots to integrate with the soil.

If the soil is naturally of poor texture and quality, the holes should be dug previously and refilled with a mixture of compost and soil to which a little bone dust has been added.

The roots of plants should be spread out in the hole so that the plant is set at the same depth as it was growing in the nursery. The previous planting level can usually be seen as a soil line on the stems. A rod placed across the hole at soil level will help to measure the level. If after the soil has settled the plant sits much too high or too low, it is better to remove it and plant again.

Among the Shrubs

Several of the hardy deciduous shrubs such as tamarisk, *Buddleia davidi*, and hydrangeas can now be pruned.

Hydrangeas should be thinned out, old flowered wood removed, and the vigorous young shoots left to flower next year. If no new shoots have developed, shoots which have flowered should be cut back to the first pair of fat buds below the flower head, and a dressing of sulphate of ammonia applied to stimulate growth.

If blue hydrangeas are required, aluminium sulphate at 1 lb per square yard and a generous dressing of potash should be given. If pink or red blooms are desired, generous dressings of superphosphate plus a little lime should be applied.

Spring-flowering shrubs like forsythia and flowering currant should **not** be pruned now, as potential flowering wood is likely to be removed. These should be pruned immediately after flowering.

The soil under established shrubs should be lightly pricked over with a fork to aerate the soil and left in small lumps which will break down during winter. A mulch of compost or sawdust could be applied round the roots.

Pruning Large Limbs

It is desirable to improve the shape of trees by judicious pruning and training in the early stages of growth. If large limbs must be removed later, it is desirable to make three saw cuts to avoid damage to the tree. The first cut should be made on the under side of the limb and about 1 ft from the junction with the tree. The second should be made on the upper side slightly closer to the junction. After the branch is removed a third cut should be made flush with the trunk of the tree to remove the stub. A dressing of petroleum jelly should then be smoothed over the wound to seal it.

Decayed areas at old stubs or bark splits should be cleaned out and the areas painted with a mixture of a fungicide such as thiram, and water, before sealing with petroleum jelly.

Climbers

Climbing plants rarely need regular pruning, but should be thinned occasionally to prevent the development of a tangled mass. The younger wood should be retained where possible, but if this cannot be sorted out on rampant growers, half the plant should be cut back hard one year and half the next. Virginia creeper is often more interesting if thinned back so that a skeletal rather than a mass effect is achieved on a wall. The yellow jasmine will now be in bud and pieces can be picked to open in a container indoors.

In northern districts climbing roses should also be pruned by removing dead or diseased wood and, where possible, tying in new unflowered shoots to replace old flowering branches. If replacement is not possible, the old flower stems should be cut back to two buds from the main

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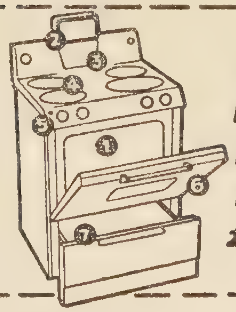

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branch. A spray of winter oil, 1 in 20 parts of water, or lime sulphur, 1 in 15 parts, should be given after pruning.

Roses

Rose bushes can be planted in prepared beds as soon as they are available. The same planting recommendations as for shrubs should be followed, care being taken to see that the plant is not too high in the ground.

In mild districts pruning can be started this month. All diseased wood should be removed and burnt. Bushes which have been sick throughout the season with each new shoot dying back from the tips are most probably infected with the soil fungus verticillium wilt and should not be pruned but dug out and burnt. The soil where they stood should be drenched with a mixture of 6 oz of copper oxychloride in 3 gallons of water per square yard.

When diseased and weak flowering stems have been removed the vigorous, healthy shoots should be lightly pruned back to a good bud, leaving about two-thirds of this season's growth.

Attention to Border Plants

Where the soil is warm the lifting, dividing, and transplanting of outer pieces of herbaceous perennials can be continued.

Agapanthus is an excellent border plant, sometimes available in a dwarf size as well as the taller-growing varieties, which flower so well in association with red kniphofia (red hot poker). Both these will flower well in poor soil.

Kniphofia zululandia should be making a good display now, but the earlier-flowering types should be cleaned up by the removal of old, untidy foliage.

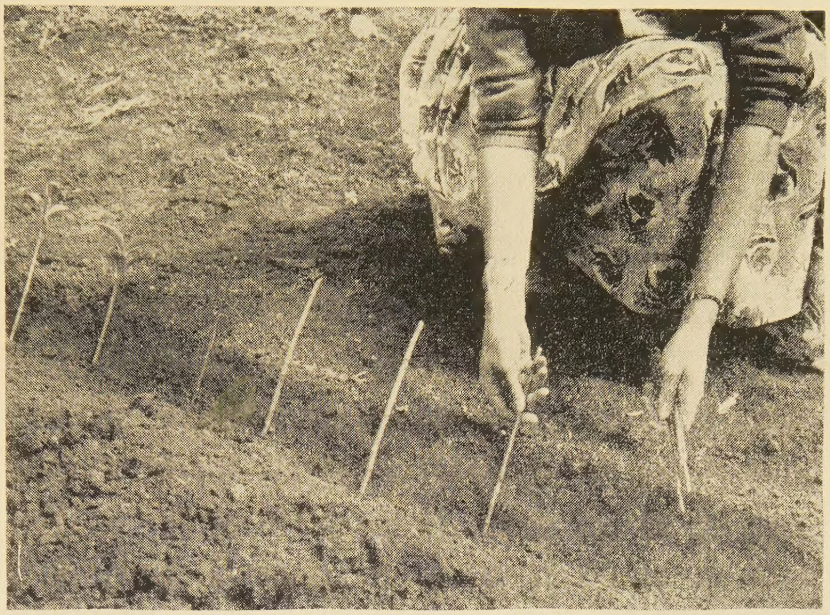
Iris unguicularis (stylosa) can be tidied up similarly and baits laid if slugs are prevalent around them.

Hellebores (winter roses) and convalaria (lily of the valley) could be mulched with sawdust to prevent the rain splashing dirt on to the flowers and a tin sleeve could be placed over the hellebores to encourage elongation of the stems.

The old flower stalks of dahlias and chrysanthemums should be cut down. Unwanted or diseased plants should be dug out and the diseased ones burnt. Plants remaining in the soil for winter could be mulched with straw or sawdust to prevent frost damage.

Hedges and Hardwood Cuttings

Escallonia hedges which look unhealthy may be suffering from attacks of root fungi, silver leaf fungi, or scale insects or thrips. Close examination may show dark staining under the bark from soil fungi; affected plants should be dug out and burnt. The trouble is often aggravated by wet soil. Before replanting, the soil should



[Sparrow

Cuttings of hedge plants being lined out in a shallow trench to root.

▼ The shrubbery can be forked over and mulched with sawdust or compost. Late summer flowering shrubs can be pruned and all plants examined to see whether they are harbouring pests.

[Campbell

GARDEN WORK FOR JUNE

[*Elliott*

Polyanthus should be planted immediately if they are to give a spring display. Many new strains and colours are available in New Zealand.

be drenched as recommended for roses. There is no cure for silverleaf disease which attacks escallonia, and affected plants should be removed and burnt.

If insects are present, a forceful spray of malathion emulsion should be used. Photinias are sometimes attacked by the mussel scale, and the same spray could be used on these. Olearia hedges affected with gall midge which causes distortion of the leaves should be clipped and the clippings burnt.

Hardwood cuttings of all hedge plants can be made up to 1 ft in length and inserted in a trench 6 in. apart to root.

Bedding Plants

The planting of spring-flowering material should be concluded as soon as possible. Wallflower plants which have not yet branched should be nipped back to encourage this. When polyanthus are being planted out one plant potted into rich compost in a 6 in. pot and plunged in the open ground until flowering can make an attractive house plant for many weeks.

Seed of calendula, candytuft, poppy, scabious, and sweet pea can be sown outdoors in mild climates. Seed for spring sowing should be ordered and seed which has been saved from the garden can be cleaned and picked over.

Packing Specimens

Specimens sent for identification or diagnosis of diseases are often poorly packed and do not arrive in good condition. Where possible, the whole plant should be sent. The soil should be washed off and the roots wrapped in damp newspaper. (This is also the best material in which to press foliage). The plant can then be enclosed in a polythene bag or greaseproof paper before being packed in a box.

Glasshouse Notes

Seed of summer bedding plants can now be sown in boxes in warmer districts. The boxes should be covered with glass to maintain humidity until the seed germinates. Cyclamen seed for next year's flowers can also be sown. Pots of cyclamen which are coming into flower can be fed with diluted animal manure or complete fertilisers. A pinch of flowers of sulphur in the crown of each plant will help prevent the rotting of stems which is likely to occur if conditions are too humid. All pot plants are better kept too dry rather than too wet at this season.

Early-flowering schizanthus can be potted on, staked, and nipped back to develop a compact bush. Calceolaria plants should now be ready for potting into the 6 in. pots in which they will flower. All plants should be examined for greenfly, and fumigation or spraying carried out as required. Heliotrope can be repotted, cut back, and started into growth. Potted hippeastrums should also be started into growth by increasing the watering. Fuchsias in pots grow best from cuttings each year, but old plants can be retained if necessary. They should now be given a rest by drying off.

All plants, including fuchsias and *Hoya carnosa*, should be examined for mealy bug. Bugs dabbed with methylated spirit on a paint brush will soon die.

Chrysanthemum cuttings for flowering in autumn can now be taken. The late-flowering varieties should be propagated first.

General

Rampant rockery plants should be cut back so that they do not crowd out slower-growing plants. Rockery pockets can be topdressed with compost, and sand can be put round grey-foliaged and close-growing plants to prevent rotting.

Moss on lawns is generally a sign that fertilisers are needed. A dressing of 3 parts of sulphate of ammonia to 1 part of superphosphate can be used at 1 oz per square yard after the treatment for moss. This treatment is 2 oz of sodium pentachlorphenol in water for every 40 sq yds of lawn. A liquid form is also available and should be used at 5 fl oz to 30 sq yds.

Garden stakes should be removed, washed clean, and stacked. It is useful to have a tin of creosote or preservative in which to stand stakes overnight. They can then be placed in another tin to drain and store until required.

Gladiolus still in the ground should now be lifted to dry off. Those which have dried off can be cleaned. Stored gladiolus bulbs should be inspected and dusted with DDT if thrips are present.

Begonia and gloxinia bulbs in storage can be examined. Diseased portions should be cut out and the wounds dusted with sulphur.

Weeding is best done by hand now, so that the weeds can be removed. If the hoe is used, there is sufficient soil moisture for many roots to re-establish.

Daphne bushes can be pruned when the flowers are picked, provided sufficient foliage is left. Judicious pruning can help to keep a bush compact. The under side of the leaves and the stems should be sprayed with summer oil if scale insects are present.

Trenching in preparation for the sowing of sweet peas in August should be concluded.

Seed boxes can be cleaned in preparation for spring sowings by soaking or thoroughly watering with a mixture of 1 pint of formalin in 4 gallons of water.

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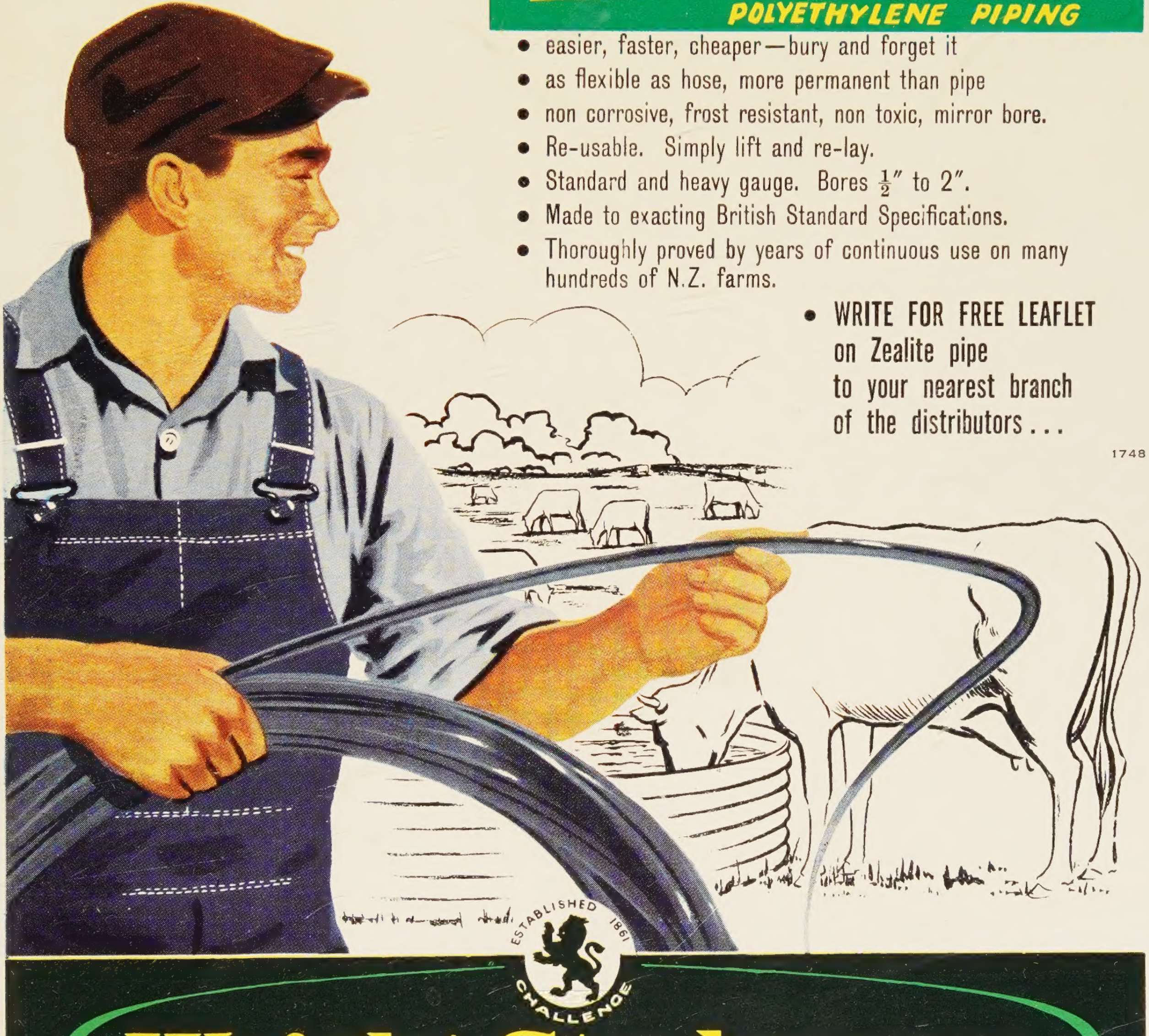

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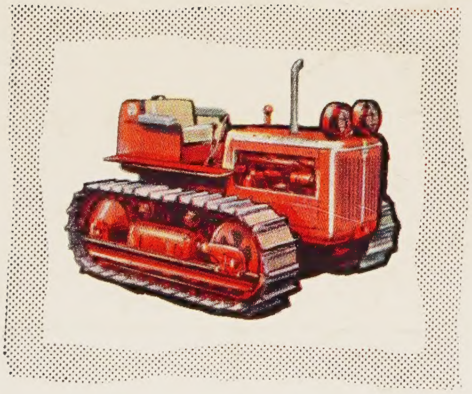

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